ABSTRACT

Title of Document: THE EFFECTIVENESS OF A COLOR-

CODED, ONSET-RIME READING

INTERVENTION WITH FIRST GRADE

STUDENTS AT SERIOUS RISK FOR

READING DISABILITIES

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Beginning readers who are weak decoders usually continue to fall behind in reading as they progress through school, negatively affecting their overall academic performance, self-esteem, and motivation. Therefore, it is imperative to develop instructional practices to assist the acquisition of effective decoding skills. Although existing remedial approaches have proven effective with a number of students with reading problems, they have not been successful with those students most at risk and have generally not resulted in transfer of skills to decoding novel words not targeted in instruction.

I used a single-subject multiple probe design across participants to investigate the effectiveness of a color-coded, onset-rime based decoding intervention. The participants were first grade students determined to be at serious risk for reading disabilities based on their performance on screening measures. All four of the students made strong progress in learning the instructional words, increasing on average 73% over baseline (range 66%-78%). In addition, for novel words from instructed rime patterns, students increased their scores from baseline to post-intervention by an average of 56% (range 50% to 62%). There was limited transfer at the vowel level to uninstructed rime patterns, with students improving their scores by an average of 29% (range 17% to 50%). All students maintained their improvement in decoding skills for both instructional and transfer words at one week and one month maintenance.

The fact that the children were able not only to master instructional words but also to use their knowledge of rime patterns to decode uninstructed words is important given the difficulty of students most at-risk for reading disabilities to master instructional words and transfer decoding gains. Furthermore, the three participants with the lowest performance prior to instruction showed strong improvement on a standardized measure of reading achievement (Woodcock-Johnson Reading Mastery Test-Revised, Normative Update). The effectiveness of the program in improving the decoding skills of readers who are significantly at-risk is a promising first step in finding an instructional approach that is successful with students who have been left behind not just by traditional classroom instruction but by remedial approaches as well.

THE EFFECTIVENESS OF A COLOR-CODED, ONSET-RIME READING

INTERVENTION WITH FIRST GRADE STUDENTS AT SERIOUS RISK FOR

READING DISABILITIES

By

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Dedication

I dedicate my dissertation to my husband Arnold O'Donnell who provided unending support in every way throughout the process. I would never have begun, continued, or completed the Ph.D. process without him.

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 Statement of the Problem

Learning to read, a prerequisite for success in our literate society, is accomplished by most children without individualized instruction. However, for a significant number of young children, mastering the initial skills of decoding is difficult. Children who do not acquire initial decoding skills are unable to activate the self-teaching mechanism required for transfer of such skills to decode novel words efficiently (Share, 1995). This lack of efficient decoding skills overloads working memory capacities for the individual and affects reading comprehension (Jenkins & O'Connor, 2002). Beginning readers who are weak decoders usually continue to fall behind in reading, which negatively affects their overall academic performance, self esteem and motivation (Elbaum & Vaughn, 2003; Snow, Burns, & Griffin, 1998). Therefore, it is imperative to develop instructional practices that will assist them in acquiring effective decoding skills that will transfer to novel words.

Although some current remedial approaches have proven effective with instructed words, they have resulted in limited transfer of skills to decoding uninstructed words (Lovett, Barron, & Benson, 2003; Lovett, Laceranza, & Borden, 2000). Furthermore, for children with the most severe problems, such approaches were not successful either in teaching instructional words or transfer of skills to uninstructed words. Torgesen, Wagner, and Rashotte (1997) stated that there are major gaps in our knowledge of how to teach reading effectively to the 3% to 5% of children with the most severe reading problems. They suggested that research must directly confront the problem of effectiveness with these children. This study addresses that issue. Research addressing effective decoding programs for the most at

risk readers is particularly important in light of the mandate of No Child Left Behind Act that all students will be able to read at grade level by 2014.

A single-subject multiple probe design across participants was used to investigate the effectiveness of a color-coded, onset-rime based decoding intervention in assisting first-grade students seriously at risk for reading disabilities in making initial decoding progress. Transfer to reading uninstructed words and maintenance was measured. The rationale for this study is based on the following: (a) the appropriateness of onset-rime instruction for early intervention; (b) the effectiveness of onset-rime instruction (c) transfer effects of onset-rime instruction; and (d) the use of color cues to enhance transfer of learning. The chapter ends with a discussion of the proposed study and a definition of terms.

Onset-Rime and Early Remediation

Over the last twenty years, there has been a consensus in the field of learning disabilities that a core language-related deficit associated with reading acquisition failure involves a domain of linguistic competence referred to as phonological awareness. Children with reading disabilities typically have relatively weak awareness of and ability to manipulate sounds (Lovett, Barron, & Benson, 2003). This basic problem with phonological awareness, in particular at the level of the phoneme (phonemic awareness), is believed to underlie the inability of the reader with disabilities to acquire basic reading decoding skills (Blachman, 1994; Bradley & Bryant, 1978, 1983; Torgesen, Wagner, & Rashotte, 1997; Share, 1995). Therefore, most research over the last twenty years involving students with reading disabilities investigated the effectiveness of decoding instruction at the level of the phoneme

(Ball & Blachman, 1991; Bradley & Bryant, 1983; Torgesen, Wagner, Rashotte, Alexander, & Conway, 1997; Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway, et al., 1999; Vellutino, Scanlon, Sipay, Small, Pratt, Chen, et al., 1996). A number of researchers (Peterson & Haines, 1992; Haskell, Foorman, & Swank, 1992; Levy & Lysynchuk, 1997), however, suggested that since difficulties with phoneme level sub-word and sub-syllabic units may be central to the word recognition failures of readers with dyslexia, the relative effectiveness of remedial reading instruction at levels other than the phoneme, such as the onset-rime level, should be investigated.

Onsets and rimes are composed of phonemes. An onset in a syllable is the initial consonant/s; the rime comprises the vowel and consonants that follow. For example, *at* is the rime in the words c*at*, h*at*, and r*at*. Traditional or synthetic phonics instruction requires the sequential blending of individual phonemes into words. For example, when encountering an unknown word *hat*, a child would identify and blend the individual phonemes /*h*/, /*a*/, and /*t*/ into *hat*. Onset-rime instruction, on the other hand, involves the analysis and substitution of word parts from known words to unknown ones at the onset- rime level; when encountering the unknown word h*at*, a child would identify the common rime with known word c*at* and substitute the initial /*h*/ sound for /*c*/ to decode.

Two current theories of reading acquisition with clear roles for specific levels of phonological awareness (i.e., phoneme versus rime) and corresponding instruction were proposed by Ehri (1991, 1998) and Goswami (1988, 1990, 1993, 1999). Ehri suggested that instruction at the level of the phoneme was primary; Goswami suggested instruction at the onset-rime level. Goswami's (1999) view was that initial

decoding instruction should be at the onset-rime level; once children mastered decoding at the more accessible onset-rime level, they would transfer that ability to the phoneme level.

Researchers investigating whether reading instruction at the onset-rime or the phoneme level was primary arrived at different conclusions. Goswami (1993), and Goswami and East (2000) determined that beginning instruction at the onset-rime level was in accord with children's natural reading progression. Others suggested that instruction at the phoneme level should precede onset-rime level instruction in accord with children's natural progression (Ehri &Robbins, 1992; Seymour & Duncan, 1997).

There are a number of reasons why initial reading instruction at the rime level may be more advantageous for students with reading problems than instruction at the phoneme level. One argument relates to the accessibility of the rime. According to Adams (1990), it is relatively easy to break the onset away from the rime; but difficult to break either the onset or the rime into its phonemic components. Preschoolers are usually unable to manipulate single phonemes (Liberman, Shankweiler, Fischer, & Carter, 1974). Young children do not easily grasp phoneme segmentation (Moustafa, 1991). Difficulty in segmenting phonemes may be because separate sounds merge in words and are not easily identified as individual sounds when listening to speech (Juel & Minden-Cupp, 2000). However, according to Anthony, Lonigan, Driscoll, Phillips, and Burgess (2003), children have a natural ability to hear onsets and rimes.

Another argument supporting initial onset-rime level instruction for struggling readers relates to the consistency of the rime unit. Although the English language is

alphabet driven, with many regular grapheme-phoneme correspondences, written English is not very consistent at the grapheme-phoneme level. The simple one-to-one correspondence between graphemes and phonemes found in transparent languages like Spanish or German does not apply to written English, in particular at the level of the vowel. Often the vowel changes in accord with the final consonant/s in a syllable (Goswami, 1999). Treiman, Mullinnex, Bijeljac-Babic, and Richmond-Welty (1995) carried out a statistical analysis of the links between spellings and sounds in all the CVC (Consonant/Vowel/Consonant) words in English and found that rime units had more stable pronunciations than individual vowel graphemes or initial consonant plus vowel units. They suggested that this factor could encourage readers to use an onset-rime approach when decoding. Stanbach (1992) analyzed the rime patterns of the 17,602 words in the Carroll, Davies, and Richman (1971) word frequency norms for children and found that all of the 17, 602 words can be classified into 824 rimes, of which 616 occur in common rime families. These data support the consistency of the rime unit in typical reading materials children encounter.

The consistency of the rime in relation to the vowel suggests another argument for onset-rime instruction in that it avoids short vowel confusion. One of the most difficult areas of phonics instruction is short vowel mastery. According to Goswami (1993), vowel misreading is twice as prevalent as consonant misreading for beginning readers. Adams (1990) stated that phonic generalizations about the pronunciation of individual vowels and vowel digraphs are "frustratingly unreliable"; however, vowel sounds are usually quite stable within rime patterns (p. 320).

Instruction with onsets and rimes also demands less facility with blending, another stumbling block for children. Rather than having to identify and then blend the phonemes *r-a-t* together to make *rat,* the child only needs to substitute the *r* in *rat* for the *c* in *cat*. O'Shaughnessy and Swanson (2000) suggested that children respond better to remedial strategies that use larger phonological units (i.e., rimes) that reduce the memory demands of blending sounds together to form words.

The above arguments in support of onset-rime instruction suggest its appropriateness for early intervention. Many researchers stressed the importance of early reading intervention (Jenkins & O'Connor, 2002; Torgesen, et al., 2001). A number of recent studies have shown that many children identified as at risk for reading failure in kindergarten and first grade and provided with effective instruction developed proficient reading skills. Torgesen et al. (2001) reported that effective early intervention programs have the capacity for reducing the expected incidence of reading failure from 18% to between 1.4 and 5.4 %. The accessibility and consistency of the rime unit make it appropriate for early intervention for struggling readers. Furthermore, onset-rime instruction avoids the common pitfalls of short vowel confusion and blending problems inherent to beginning reading instruction.

Effectiveness of Onset-Rime Instruction

A number of researchers assessed the relative effectiveness of onset-rime level instruction. Research with normally developing beginning readers was inconclusive (Walton & Walton; 2002; Haskell, Foorman, & Swank, 1992; Christensen & Bowey, 2005). Such results, in addition to being contradictory, were confounded by different treatment times, short duration of treatment, small sample size, different definitions of

beginning reading, different approaches to onset-rime instruction, and different types of instruction (e.g., whole word, phoneme) used in comparison conditions.

It appears that the path to reading achievement may be different for students with or at risk for reading disabilities (Bruck, 1992). A number of researchers looked specifically at the effectiveness of onset-rime based instruction with children with or at risk for reading disabilities (Levy & Lysynchuk, 1997; Walton, Walton & Felton, 2001; Savage, Carless, & Stuart, 2003). Their results were generally supportive of onset-rime instruction. Interpretation, however, was compromised by assignment of whole classrooms to intervention in response to teacher choice, non-comparable interventions, and different amounts of treatment times. In accord with the research with normally beginning readers, research involving students with or at risk for disabilities indicates the necessity of knowledge of sound-symbol correspondence for success with rime based analogy instruction.

Transfer Effects of Onset-Rime Instruction for Students at Risk for Disabilities

Learning words taught during instruction is not the only measure of the effectiveness of an intervention. According to Share (1995, 2004) instruction must result in children's acquiring access to the code of reading to allow phonological recoding of uninstructed words. Students must acquire what Share calls the "self-teaching" mechanism to transfer knowledge about the reading of instructional words to effectively decode uninstructed words. The self-teaching hypothesis proposes that only the ability to translate a printed letter string into its spoken form (phonological recoding) offers a reliable means of independently identifying new letter strings.

Acquiring this ability to transfer skills to decoding uninstructed words following reading instruction is a significant problem for students with or at risk for disabilities (Lovett, Barron, & Benson, 2003; Lovett, Laceranza, & Borden, 2000). Therefore, according to Lovett et al. (2003) evaluating the effectiveness of an intervention involving students with reading problems requires measurement of mastery of instructional words as well as transfer effects to decoding uninstructed words. Regarding the lack of transfer following instructional gains, Lovett et al. (1990) speculated that children's word recognition gains were not based on new knowledge about grapheme-phoneme correspondence, but on the acquisition of specific knowledge about individual words. Such word-specific knowledge is not economical because it provides no basis for reading new or unfamiliar words. Lovett et al. (1990) hypothesized that the lack of transfer may result from the failure of children with reading disabilities to use sub-word units such as rimes to draw analogies as a basis for transferring their new lexical knowledge. They argued that remedial decoding programs emphasizing rime units may be necessary to effect transfer of decoding skills for students with reading problems to uninstructed material and suggested research on the transfer effects of onset-rime based instruction.

Woolfolk (2001) described transfer as occurring when something previously learned influences current learning or when solving an earlier problem affects how one solves a new problem. Therefore, if knowledge of how to decode an individual word helps to decode an unfamiliar word, transfer has occurred. Specific or near transfer is defined as occurring when a skill learned in one situation is applied to another, very similar situation. General or far transfer is defined as occurring when

that skill is applied to a dissimilar situation (Woolfolk). In the present study, near transfer refers to the decoding of novel words from instructed rime patterns. Far Transfer refers to the decoding of novel words from uninstructed rime patterns (sharing only the vowel).

The results of investigations regarding transfer effects for students with reading disabilities following instruction based on onset-rime segmentation indicated relative support for an onset- rime approach in comparison with instruction at other word levels (O'Shaughnessy & Swanson, 2000; Levy & Lysynchuk, 1997; Savage et al., 2003).

Color-Coding to Enhance Transfer

Although some researchers investigated the use of color cues to enhance mastery and transfer of learning for students with disabilities (Goodman & Cundick, 1976; Doyle, 1982; Van Houten & Rolider, 1990), research on the use of color cues to enhance the mastery and transfer effects of onset-rime based interventions is limited. Levy and Lysynchuk (1997) successfully used color to highlight the rime in their intervention with non-readers in kindergarten and first grade. Levy (2001), in an effort to increase transfer for struggling readers, investigated the effects of visually blocking and/or color coding of the rime unit for low achieving second grade readers. The results indicated that blocking and/or blocking combined with color highlighting of the rime led to faster learning of targeted and transfer words. According to the author, visual pattern support within the print itself can help struggling readers. Levy suggested future research investigating the effect of visual support linking the rime to its pronunciation to enhance transfer.

Current Study

In light of the above research and theoretical arguments, I investigated the benefit of onset-rime instruction for fostering mastery and transfer of word reading skills in first grade students at risk for reading failure. A color-coding system for each rime pattern was used to enhance the salience of the rime and link it to its pronunciation.

This approach is supported by research findings that onset-rime instruction is developmentally more appropriate and accessible than instruction at the phoneme level, that such instruction is relatively effective regarding mastery of instructed words with students with reading problems, that transfer of acquired reading skills to uninstructed material is a problem for such students, and that visual support emphasizing the rime unit enhances mastery as well as transfer for students with disabilities.

Based on the literature, I expected that the intervention would be effective in improving substantially the students' ability to read instructional as well as novel words from instructed rime-patterns. I also expected some transfer at the vowel level to uninstructed rime patterns; however, such transfer was expected to be much weaker than transfer to novel words from uninstructed rime patterns.

I investigated the following research hypotheses:

1. A color-coded, onset-rime decoding intervention will be effective in improving performance on taught words for students with or at risk for reading disabilities.

2. Students will transfer their ability to decode instructional words to novel short vowel words from instructed rime patterns (near transfer).

3. Students will transfer their ability to decode instructional words to novel short vowel words from uninstructed rime patterns (far transfer).

4. Students will maintain their decoding skills for instructional and transfer words one week and one month after instruction ends.

<div align="center">*Definition of Terms*</div>

Analytic Phonics (Implicit Decoding) is an instructional approach wherein children learn to analyze letter-sound relationships in previously learned words. This approach does not include the pronouncing of sounds in isolation.

CVC Word refers to a single syllable word with the following sequence: consonant, short vowel, consonant (e.g., cat).

CVCC Word refers to a single syllable word with the following sequence: consonant, short vowel, consonant, consonant (e.g. bell).

Decoding (*Recoding*) is the ability to translate a word from print to speech.

Dyslexia is a specific learning disability characterized by difficulties with accurate and/or fluent word recognition, and by poor spelling and decoding.

Encoding is the ability to translate a word from speech to print.

Grapheme is a letter or letter combination that spells a single phoneme.

Learning Disability is not a specific term; it is a category containing many specific disabilities, all of which cause learning to be difficult.

Onset-rime instruction is a form of analytic phonics, at the onset-rime level. The onset in a syllable is defined as the initial consonant/s; the rime is defined as the vowel and the consonant/s that follow.

Phonics is an approach to teaching word identification through emphasis on letter-sound (phoneme-grapheme) correspondence.

Phoneme is the smallest unit of sound in a word

Phonemic Awareness is the ability to manipulate phonemes in spoken words

Phonological Awareness is the ability to manipulate word parts, including phonemes as well as those larger than the phoneme, in spoken words

Pseudo Word (Non-Word) is a phonetically regular combination of letters that does not constitute an actual word...

Synthetic/Sequential Phonics (*Explicit Decoding*) is an approach to decoding requiring left to right sound identification and blending in accord with specific sound-symbol rules.

Transfer (Generalization) occurs when something previously learned influences current learning. Therefore, if knowledge of how to decode an individual word helps to decode an unfamiliar word, transfer has occurred.

Near Transfer occurs when a skill learned in one situation is applied to another, very similar situation. Specifically in this study, it refers to the decoding of novel words from instructed rime patterns.

Far Transfer occurs when a skill learned in one situation is applied to a dissimilar situation. Specifically in this study, it refers to the decoding of novel words from uninstructed rime patterns, which share only the vowel with instructional words.

CHAPTER 2 Review of the Literature

Learning to read is a requirement for success in our educational system and literate society. Children who are poor decoders usually continue to fall behind in reading, which negatively affects their overall academic performance, as well as their self esteem and academic motivation (Torgesen, 1997). According to Jenkins and O'Connor (2002), early struggles in reading translate into deficient reading and writing skills throughout a student's educational experience. Therefore, professionals must identify the most effective reading instruction for beginning readers.

Research over the past 20 years has supported the idea that the most common form of reading disability is caused by the inability to process the phonological features of language (Torgesen, Wagner,& Rashotte ,1997). Therefore, current approaches to instruction for students with reading disabilities emphasize remediation of the assumed core phonological processing deficit (Jenkins & O'Connor, 2002). Such remedial instruction is generally at the sub-word level of the phoneme. Lovett (1991) suggested that difficulties with sub-word and sub-syllabic units might be central to the word recognition failures of readers with dyslexia. She recommended research on the relative effectiveness of remedial reading instruction at sub-word levels other than the phoneme, specifically instruction at the onset-rime level.

Words are made up of syllables; syllables are in turn composed of onsets (initial consonants or consonant clusters) and rimes (the vowel and final consonant/s). For example, *at* is the rime in the words c*at*, h*at*, r*at* etc. Onsets and rimes are composed of sound units or phonemes. Traditional or synthetic phonics instruction requires the sequential blending of individual phonemes into words. For example,

when encountering an unknown word *hat*, a child would identify and blend the individual phonemes /*h*/, /*a*/, and /*t*/ into *hat*. Onset-rime instruction, on the other hand, involves the analysis and substitution of word parts from known words to unknown ones at the onset- rime level. When encountering the unknown word h*at*, a child would identify the common rime with known word c*at* and substitute the initial /*h*/ sound for /*c*/ to decode. Thus, onset-rime instruction is sometimes referred to as analogy based decoding.

As discussed in Chapter 1, instruction with onsets and rimes has several potential advantages. One possible advantage results from its accessibility. According to Adams, it is easier to break the onset away from the rime than to break either the onset or the rime into its phonemic components. Preschoolers are usually unable to manipulate single phonemes (Liberman, Shankweiler, Fischer, & Carter, 1974, Moustafa, 1991). Difficulty in segmenting sounds may be due to the fact that separate sounds merge in words and are not easily identified as individual sounds when listening to speech. However, according to Anthony et al. (2003), children have a natural ability to hear onsets and rimes. Kirtley, Bryant, McLean and Bradley (1989) found that preschool children were more successful categorizing words on the basis of onsets and rimes than on the basis of initial consonants or consonant combinations.

Another argument supporting onset-rime instruction is that it avoids short vowel confusion. According to Goswami (1993), decoding errors involving vowels are twice as prevalent as those involving consonants for beginning readers. Adams (1990) states phonic generalizations about the pronunciation of individual vowels and

vowel digraphs are "frustratingly unreliable"; however, vowel sounds are usually

quite stable within rime patterns (p. 320).

Instruction with onsets and rimes also avoids phoneme blending, another area

of difficulty for struggling readers. Rather than having to name and blend the

phonemes *r-a-t* together to make *rat,* the child only needs to substitute the *r* in rat for

the *c* in cat to decode. O'Shaughnessy and Swanson (2000) suggested that children

respond better to remedial strategies that use larger phonological units (i.e., rimes)

reducing the memory demands of blending sounds together to form words.

Finally, onset-rime instruction as a beginning reading program is supported by

the developmental model of phonological sensitivity proposed by Adams (1990) as

well as Goswami (1993), a model supported by the research of Stahl and Murray

(1994) and Anthony, Lonigan, Driscoll, Phillips, and Burgess (2003). According to

this developmental model, children's phonemic awareness progresses from larger to

smaller linguistic units (i.e. from words to syllables, to onsets and rimes, to individual

phonemes). Anthony et al. (2003) suggested that this developmental model of

phonological sensitivity be used to design instruction.

The purpose of this chapter is to critically review the evidence on methods of

teaching beginning reading, emphasizing onset-rime instruction. In the review, I focus

on research investigating (a) the natural progression of children's beginning reading

acquisition, (b) the relative efficacy of onset-rime instruction regarding mastery of

instructional words and transfer of decoding skills for normally developing beginning

readers, (c) the relative efficacy of onset-rime instruction regarding mastery of

instructional words for students with or at risk for reading disabilities, (d) transfer of

learning for students with or at risk for reading disabilities and, (e) the effects of visual blocking (e.g., color-coding) the rime pattern on mastery and transfer of onset-rime instruction for such students. The following is a description of the method and results of the literature search.

Method

I conducted a computer search of several data bases using multiple key words including "Onset" and "Rime", "Reading Development", "Reading" and "Development* Model", "Reading" and "Rime", "Reading" and "Word Famil*", "Decoding" and "Analogy", "Rime" and "Disab*", "Reading" and "Transfer", "Reading" and "Color", "Learning Disab*" and "Color", and "Rime and Block*". Data bases searched included Education Abstracts, ERIC (EBSCO), PsycInfo, PsycArticles, Web of Science, and Digital Dissertations.

I also conducted an ancestral search of the following periodicals identified by the electronic search to locate additional articles pertinent to the study: *Journal of Educational Psychology, Scientific Studies of Reading, Journal of Experimental Child Psychology, Journal of Learning Disabilities,* and *Reading Research Quarterly.* I selected and read 16 articles involving developmental models of reading acquisition, 22 articles describing research studies involving onset-rime instruction with normally developing readers, 28 articles involving onset-rime instruction with students at risk for disabilities, 15 articles investigating transfer of reading skills for students at risk for disabilities, and 10 articles investigating the use of color cueing to enhance mastery and transfer for students at risk for disabilities.

After identifying this initial corpus, I applied several exclusion criteria. The focus of this study is effective beginning reading instruction. Therefore, regarding normal or at-risk readers, I limited this research review to studies involving second grade or younger students; regarding students with disabilities, to studies involving beginning readers. For analysis, I combined studies involving students with learning disabilities and those involving students at risk for reading disabilities since it is difficult to differentiate between early readers with developmental issues and those with actual learning disabilities. I did not include studies of English language learners or students with diagnosed disabilities other than learning disabilities in this review, since such studies were few in number and evaluated methods that had been adapted in such a way that they were fundamentally different from those usually considered to be based on onsets and rimes. I also eliminated articles that focused solely on the effectiveness of spelling techniques, as opposed to reading instruction. I included articles detailing studies in English speaking countries throughout the world, since there was limited US research. I did not include research in non-English speaking countries because of language differences in transparency as compared to English. I did not limit my search based on the date of the studies; however, no studies prior to 1985 were identified by either the electronic or ancestral search. The final review of literature consisted of six articles that investigated developmental models of reading acquisition, five articles that investigated the effectiveness of onset-rime instruction for normally developing readers, six articles that investigated the effectiveness of onset-rime instruction for children with or at risk for disabilities, nine articles that investigated transfer of learning following reading instruction for

children with or at risk for disabilities, three articles that investigated the use of color-coding to enhance learning for students with disabilities, and two articles that specifically investigated the use of color to facilitate mastery and transfer of reading skills for students with reading problems. Regarding articles included in this review of literature, all results reported are significant, unless otherwise noted.

Results

Natural Progression of Children's Reading Acquisition

For the past fifteen years, phonological awareness has been linked to beginning reading progress. Phonological awareness was defined by Stahl and Murray (1994) as the ability to identify and manipulate speech sounds. Two current theories of reading acquisition that have clear roles for specific forms of phonological awareness were proposed by Ehri (1991, 1998) and Goswami (1986, 1990, 1993) Their models are similar in that phonological abilities are essential to the development of reading, that reading ability and phonological skills interact and develop reciprocally, and that children use letter decoding and analogy reading strategies early in the reading process. The models differ regarding the order that phonological awareness develops and that specific reading strategies are acquired. Ehri and Robbins (1992) suggested that phonemic awareness and letter decoding strategies are primary and proposed that the reading strategy used by most beginning readers is letter decoding, with children sounding out and then blending individual phonemes into words. Goswami (1986) suggested that a child's phonological awareness progresses from larger to smaller linguistic units (i.e. from words to syllables, to onsets and rime, to individual phonemes). She proposed that reading

words by analogy is one of the earliest methods used, even before readers are able to phonetically decode words. Specifically, beginning readers note similarities between known words and unfamiliar words that share rime spellings. These two theoretical approaches are often referred to as the small unit and large unit theories, respectively. They differ in their claims about the size of the linguistic units important in the early stage of reading acquisition: phonemes for the small unit theory, onsets and rimes for large unit theory.

   Large unit theory. Goswami (1986, 1988, 1991, and 1993) conducted numerous experiments investigating onset-rime analysis and early reading to support her model of reading development. One of Goswami's most cited studies (1993) involved three experiments in which she measured beginning reader's ability to decode instructional words containing vowel graphemes (e.g., a, ea). Specifically, she investigated whether beginning readers naturally decode vowel graphemes as part of the rime or as independent units. She predicted that the vowel graphemes would be perceived and decoded by children as part of the rime cluster, therefore transfer would occur only for words sharing the rime. To investigate, Goswami examined transfer from key words (beak) to new words that shared the vowel grapheme (h*ea*p) or the entire rime (p*eak*). She also hypothesized that as children developed as readers they would use their ability to decode at the onset-rime level to establish connections at the phoneme level. Therefore, the three experiments used progressively more complex single syllable words with progressively better readers to mirror the development of phonic skills. Therefore, Goswami predicted that beginning readers would only achieve transfer to words sharing the rime pattern of key words (defined

as near transfer in the current study. However, as their reading skills improved, they would also evidence transfer to words that only shared the vowel (defined as far transfer in the current study).

In Experiment 1, 29 children with a mean reading age of 6-5 were participants. The children were taught a key word containing a single vowel grapheme (e.g., b*ug*) which remained visible while the children were asked to decode nine new words. Three of the new words shared the rime (e.g., r*ug*), three shared the onset and vowel (e.g., *ru*n), and three shared the vowel (e.g., c*u*p) with the clue word.

As predicted, Goswami found that the only significant increase from pre-test to analogy post test in the number of words read correctly occurred for the rime words. She stated that the results of the experiment supported her hypothesis that beginning readers initially code pronunciations for vowel graphemes in the grapheme cluster representing the entire rime.

In Experiment 2, Goswami extended the results of Experiment 1 to vowel digraphs (e.g., b*eak)*. There were 20 participants; however, they were more advanced readers with pre-test scores indicating an average reading age of 6-10. Goswami found that although most transfer occurred to the rime words, a significant improvement in the students' performance in reading the vowel only words also occurred. Goswami stated that the pattern of transfer shown by the children in Experiment 2 indicated that emergent phonetic coding was established as a result of onset-rime decoding.

In Experiment 3, she attempted to extend the findings of Experiment 2 with 24 even more advanced readers with a mean reading age of 7-6. The words contained

single vowel graphemes as in experiment 2, but they either began or ended with consonant clusters (e.g., ta*sk*). In contrast to the results of Experiment 2, the children did not consistently transfer decoding ability to words that only shared vowel graphemes, although there was evidence of transfer to shared onset-vowel and onset-rime words. According to Goswami, the difference in performance possibly reflected the relative consistency of the vowels used in each session; the larger the vowel cluster (i.e., Experiment 2) the more consistent the pronunciation.

One problem with the study is that each experiment involved a different group of children at different reading ages. There might have been group differences beyond the differences in reading age that resulted in differential transfer patterns. Another issue is that Goswami, in keeping with her other experiments, tested children's abilities to draw analogies to a visible clue word rather than to known words held in memory. By testing transfer of rime-based analogy skills to words stored in memory, the strength of the instructional procedure could have been better assessed. It is this drawing of analogies to words held in memory that is required in actual reading tasks.

Goswami extended her findings from this and other experiments to contend that awareness of onset and rime is causally related to children's success in learning to read. Goswami (1993) stated that "children begin learning to read by establishing orthographic recognition units for words that have phonological underpinning… initially at the onset-rime level." She continued, "As reading develops this phonological underpinning is thought to become increasingly refined, resulting eventually in complete phonemic underpinning to supplement the original onset-rime coding" (p. 469).

Small unit theory. To test Goswami's claim that beginning readers decode using onset-rime analysis, Ehri and Robbins (1992) conducted a study investigating the ability of 100 kindergarten and first grade students to read words by analogy at the onset-rime level. The authors criticized Goswami's use of experimental words containing difficult to decode sound complexities such as consonant blends and long vowels, suggesting that her findings might be particular to the kinds of spellings that she tested. Although this is generally true of Goswami's experiments (e.g., 1986, 1988, 1991), in Goswami's first of three experiments (1993) detailed above, she used only CVC words.

Ehri and Robbins (1992) also argued that to read an unknown word such as *peak* by analogy to the known word *beak*, the reader must have enough letters in *beak* stored in memory to recognize how they resemble but differ from *peak*. They hypothesized that beginning readers need some decoding (recoding) skills to read words by analogy and that children with insufficient decoding skills would be unable to draw analogies at the onset-rime level. They also hypothesized that readers with sufficient decoding skills would be more successful at reading words by onset-rime analogy than at reading words phonetically.

During training, children were taught five key words and then asked to decode five new words. The researchers used non-words with unconventional spellings with upper-case letters as training words. Long vowels were indicated by doubled letters topped by a horizontal bar, consonants by single letters. The children's ability to transfer knowledge of the training words to words sharing the rime or sharing the vowel was measured and compared for children who were classified as decoders

versus non-decoders at pre-test. In the current study, such transfer to novel words sharing the rime with instructional words is defined as near transfer; transfer to novel words sharing only the vowel, far transfer.

Although Ehri and Robbins used the term "transfer" in the 1992 study, in other writings, Ehri (2005) refers to transfer as "analogizing", a process that requires using the memory for the structure of a known word to decode to a new word. According to Ehri, such analogies can be drawn using knowledge of connections between individual graphemes and phonemes; or, knowledge of spelling patterns, including common rimes.

Ehri and Robbins found that beginning readers initially classified as decoders had an easier time reading unfamiliar words when the words shared rime units with known words than when the words shared letter-sound correspondence. Non-decoders were not able to read any of the novel words, a finding they interpreted as indicating that beginning readers need phonological decoding skills to read words by onset-rime analogy.

There are several problems with the authors' conclusions. Their claim that phonological decoding skills are necessary to read words by analogy seems to be an over-extension of their findings. Participants (decoders and non-decoders) were required to only know the names of 11 of the 16 upper case letters (consonants and vowels) used in instructional materials; there was no requirement regarding the ability to match letters and sounds. Therefore, it is not surprising that participants classified as non-decoders were unsuccessful reading words by analogy, since knowledge of consonant letter/sounds is necessary to substitute the onset to decode. In fact, the

researchers stated that a common error of the non-decoders was to misread transfer words as key words (i.e., *cave* for SAAV), which might indicate the participants' ability to draw an analogy at the rime level, but inability to identify and match the new onset to its appropriate sound. Another problem with the study was the authors' creation of a unique visual system to represent sound-symbol associations, possibly confusing non-decoders who already possessed a shaky knowledge of sound-symbol associations. One advantage of the study, however, is that the authors examined students' ability to draw analogies at the onset-rime level in the absence of a clue word, more in accord with normal reading experience.

Although the study had interpretation issues, other researchers provided support for the theory that reading acquisition develops from phoneme to onset-rime units. Duncan, Seymour, and Hill (1997) also investigated small versus large unit theories of reading acquisition in the Dundee Longitudinal Study, which followed three-year-old children through their first two years in primary school in Scotland.

As part of the longitudinal study, the authors conducted three experiments with the students during their first year of primary school (equivalent to kindergarten). The children had received seven months of phonics based reading instruction with focus on letter-sounds prior to the experiment. For the first experiment, the researchers constructed four types of non-words which shared large or small segments with words present in the children's sight vocabularies: onset+rime (e.g., *han* from *h*elp + c*an*)*,* body+coda (e.g., *calp* from *ca*n + he*lp),* body +rime (e.g., *stot* from *sto*p + n*ot*), onset + peak + coda (e.g., *yat* from *y*es + c*a*n + no*t*). The

authors measured which type of words was easiest to read for the children and concluded that there was no significant advantage for rime-based non-words.

The authors' classification of the non-words is problematic. Their claim that some non-words in the last category (e.g., yat) did not share a body or a rime with any known word, but were instead composed of small elements contained in known words, is likely not true, since *cat* is a word commonly identified by young children. The authors should not have assumed that because a word was not taught by direct instruction in the classroom, a child did not have that word stored in memory available for analogies in reading.

The second experiment, which was administered after ten months of reading instruction, was more convincing. Known sight words were read by the examiner and placed in front of the students. The children were then given a sound (e.g., onset, vowel, or rime) and asked to mark the letters which corresponded to the sound. The researchers found that children averaged 90% correct for the onset and vowel units, but only 60% correct for the rime units.

In a third experiment, the researchers measured the children's performance on two common unit tasks. In the first task, they presented the children with word pairs using one of the real words used in the first experiment. Pairs shared either a common body (e.g., *ca*t-*ca*n), common rime (e.g., d*ad*-s*ad*), common onset (e.g., *st*op-*st*ar), common peak (e.g., h*o*me-r*o*pe), or common coda (e.g., loo*k*, wea*k*). The children were required to identify the common unit in the orally presented pairs. The second common unit task was similar but words were selected from the spoken vocabulary of five-year-olds.

The researchers found that for all of these tasks the identification of common units corresponding to rimes was the most difficult. The authors interpreted these findings to support the theory that reading development progresses from smaller to larger orthographic units. The authors stated, consistent with Ehri and Robbins (1992), that the "results strongly suggest that the progression in normal reading acquisition is from a small unit (phonemic) approach in the initial stage towards a large unit (rime based) approach at a later stage" (p. 130).

Instructional effect. According to Goswami and East (2000), a problem with the above study is that children in Scotland receive intensive phoneme-based literacy instruction from the beginning of their schooling influencing their reading progression. Goswami and East (2000) conducted two experiments to investigate whether the findings of Duncan et al. (1997) would hold up with five-year-old children in primary schools in England.

Their first experiment examined the performance of 29 five-year-olds on two tasks that had been previously used in another experiment in Scotland (Seymour & Evans, 1994); one task involved sound segmentation, the other blending. Goswami and East (2000) also included an onset-rime and phoneme level oddity task. Children were in classes with elements of phonics and whole language instruction with a whole language bias, according to the authors. The children were not receiving any rime based instruction.

Results indicated that the overall student performance on all tasks was significantly superior at the onset-rime level than at the phoneme level. Goswami and East (2000) suggested that an early facility with small units appears to depend on

whether children are receiving explicit literacy instruction at the phoneme level. They argued that the early accessibility of the rime as a phonological structure explained the ability of children to perform tasks at the onset-rime level without classroom instruction focused on that larger unit.

The second experiment investigated whether student performance on the first common unit task used by Duncan et al. (1997) was also dependent upon instructional practice. Goswami and East studied a group of five-year-olds who were matched by age and time in school to Duncan et al.'s (1997) participants. Similar to the children in Experiment 1, the students were in a program emphasizing sight word instruction through a whole language approach as well as systematic instruction in letter-sounds and were not receiving any rime-based instruction.

There were two testing sessions. During the first session, the researchers administered Duncan et al.'s (1997) first common unit task using the same stimuli and presentation conditions. The first testing session replicated Duncan et al.'s (1997) findings of a selective deficit in rime judgments. Since the children seemed unsure how to respond and typically produced the first sound in the given word, the researchers inserted a brief period of instruction at the rime level (five hours total over eight weeks). After such instruction, the authors readministered the task. They also tested the students with the oddity task used in experiment one and a same/different judgment task.

The second testing session, after onset-rime instruction, indicated that there was no longer a deficit in rime judgment as measured by the common unit task. The authors interpreted this result as indicating that the measure is dramatically affected

by literacy instruction and should not be used to support the contention that reading

development progresses from small to larger units. This argument was supported by

the children's performance on the same/different judgment task, which indicated that

awareness of rimes was superior to awareness of peaks (vowels) and codas (final

consonants). Another interesting finding is that the children's performance on the

oddity task increased by about 20% from session 1 to session 2, across all levels of

the task. The authors used the data to support the contention that the effects of rime

based literacy instruction may extend beyond large unit variables to phonemes.

A problem with the study is that there was no control group, so it is difficult to

ascertain that the improvement in the onset-rime common unit task was a direct result

of the onset-rime instruction. However, the change in the data from the first to the

second session, regardless of the cause, indicated that the common unit task is not a

reliable indicator of the natural progression of children's reading acquisition.

Summary. It appears that research is not definitive regarding whether small or

large unit theories better explain the natural reading progression of beginning readers.

A confounding issue is that instruction seems to strongly influence a child's approach

to decoding strategies. However, it is clear that if onset-rime instruction is determined

to be a natural antecedent to sequential phonics instruction, knowledge of consonant

sound-symbol relationships should be a prerequisite to that onset-rime instruction.

A theoretical model of reading development proposed by Stahl and Murray

(1994) makes sense given the conflicting results of the above experiments. The

authors selected 113 kindergarten and first-grade children and tested their

phonological awareness with fourteen tests designed to measure blending, isolation,

segmentation, and deletion skills at four levels of linguistic complexity. The researchers found that the easiest linguistic level for the children to analyze was the onset-rime. The authors also looked at the correlations between the children's skills and found that children who could perform onset-rime manipulations had stronger letter identification skills, and that children with stronger word recognition skills generally could perform onset-rime manipulations more successfully. The authors speculated about a series of necessary but not sufficient conditions among the variables examined: knowledge of letter names allows children to manipulate the onset to decode by analogy at the onset-rime level, which enables basic word recognition, which enables the development of phoneme level skills. The authors' proposed sequence of decoding development seems likely; however, I suggest the inclusion of letter sounds with letter names as the first step.

An analysis of intervention research will help to clarify what model of reading acquisition is appropriate to design instruction for beginning readers, those developing normally and those at risk for disabilities. Possibly different models of reading development are appropriate for students developing normally versus those with or at risk for disabilities.

Effectiveness of Onset-Rime Based Instruction for Normally-Developing Beginning Readers

The distinction between small and large unit theories of reading acquisition is important because it informs instructional decisions. A belief in the small unit theory would result in an initial focus on knowledge of sound-symbol associations and phonic decoding; a belief in large unit theory would result in focus on rhyming skills

and grouping words into rime or word families (Seymour & Duncan, 1997). Research involving the relative effectiveness of interventions at the onset-rime level was investigated.

Onset-rime in comparison to control. In accord with Goswami's claim that onset-rime experience leads to phonological awareness, Peterson and Haines (1992) hypothesized that instruction in using orthographic analogies at the onset-rime level would facilitate children's letter-sound knowledge as well as phonic segmentation ability. The authors reasoned that reading instruction would best facilitate letter-sound knowledge and segmentation skills if the rime, which they considered to be the natural unit of children's speech, was used in instruction.

Forty-eight kindergarten children were randomly selected from six kindergarten classrooms, matched by performance on a segmentation skills test, and randomly assigned to a treatment or control group. Before training, the authors also measured the children's letter-sound knowledge and word recognition by analogy skills to assure that there were no differences between the two groups. The control group remained in the regular classroom. Based on pre-test performance, the authors classified the children in the experimental group as high, middle, or low segmenters. Each child in the experimental group was trained for a maximum of seven 15-minute sessions over a one month period. In each session, the researchers introduced a key word (i.e., b*all*) and instructed participants to segment it into its onset (*b*) and rime (*all*). Then they introduced four new words from the same rime family (e.g., f*all*), pointing out their similarity to the key word. They followed this procedure for 10 different rime patterns. At post test, each student's letter-sound knowledge,

segmentation ability, and word recognition by analogy was measured with the same tasks used at pre-test.

The data analysis was conducted in two stages. First, the researchers examined the correlation between ability to read words by analogy and segmentation skills at pre-test; then they analyzed the effects of the onset-rime instruction on segmentation ability, letter-sound knowledge, and ability to read words by analogy. The researchers found that pre-test ability to read words by analogy related directly to the child's ability to perform segmentation tasks. They stated that their findings confirmed Goswami's premise that children's early ability to read words by analogy leads to the development of phonic skills. Their conclusion seems rather strong based on their findings. One could argue that the findings supported Ehri and Robbins's (1992) claim that children need some phonic skills to read words by analogy.

The authors also assessed the effects of the training at post test. Overall, the rime group outperformed the control group on segmentation ability, letter-sound knowledge, and ability to read words by analogy. The authors used the results to support their contention that onset-rime instruction results in the development of phonic skills. Unfortunately, the performance of students receiving onset-rime instruction was not compared to students receiving another method of instruction. In addition, the experiment was for a very short period of time (a maximum of seven 15 minute sessions).

Onset-rime in comparison to pre-reading skills instruction. Walton and Walton (2002) did compare onset-rime instruction to two other methods of instruction. The progress of three treatment groups (onset-rime, pre-reading skills

instruction, combination onset-rime and pre-reading skills) and a control group were compared on pre-reading and word level skills.

The participants were pre-readers selected from six kindergarten classrooms over three school years. Pre-readers were those children who could not read more than one word from a reading test consisting of eight CVC words. The authors pre- and post tested participants' rhyming ability, phoneme identity, letter sound knowledge, and phonological working memory. Post testing also included a reading measure of words in isolation that were either decodable by analogy or phonic decoding.

Children were randomly assigned over the three years to treatment groups or to a control group where they listened to stories. The researchers taught the children in small groups for 25-minute sessions twice a week for 10 weeks. Treatment consisted of one to two minutes of direct instruction followed by a researcher-designed cooperative game to provide experience with the skill emphasized in direct instruction

Results at post test indicated that children across treatment conditions had significantly more success reading words decodable by rime analogy than phonic decoding. Children in the combined rime analogy and pre-reading skills group were significantly more successful in reading both rime analogy and decoding words, followed by the pre-reading skills group, followed by the rime analogy group, followed by the control group. In addition, children made significantly greater gains in phoneme identity and letter sound knowledge in the treatment groups where these skills were taught directly (pre-reading skill group, combination group), than in the

analogy (rime) and control groups. The children in the rime analogy group, however, were the only ones to improve significantly their abilities to identify phonemes in middle and final positions beyond controls. This is an interesting finding since the researchers did not teach these skills to any group. According to the authors, in accord with Goswami's contention and the findings of Peterson and Haines (1992), the result suggests a relation between experience with reading by rime analogy and the later development of phonic skills. The authors stated that they support a multi-technique approach to reading instruction since instruction focused solely on the rime analogy strategy or the pre-reading skills was relatively less effective than a combined program providing pre-reading skill training in combination with rime-analogy instruction. It should be noted that the pre-reading skills instruction was restricted to rhyming, initial phoneme identity, and letter sounds.

Unfortunately, the study was conducted over a three-year period because the kindergarten classes in a given year had too few participants to assign to all conditions. The researchers stated that, as a result, teacher effects across the three years were not controlled. As discussed in relation to the study of Ehri and Robbins (1992), the logic of the findings regarding the necessity of some phonic based pre-reading skills to successfully use a rime analogy strategy is undeniable.

Onset-rime in comparison to sequential phonics and whole word instruction. Haskell, Foorman, and Swank (1992) compared onset-rime instruction to sequential phonics and whole word instruction, randomly assigning 48 first graders to an onset-rime, phoneme, whole word, or control group. The control group received the regular whole language classroom instruction. The treatment groups did not significantly

differ on pre-test measures of reading skills. However, students in the onset-rime group were significantly older than students in all other groups. The authors stated that the age difference did not result in a skill advantage at pre-test; therefore, age was not retained as a variable in the design.

All of the children were pre-and post tested with a word-reading list that consisted of the 60 one-syllable words used in instruction. Forty words had regular spelling patterns (e.g., led) and twenty had exception spelling patterns (e.g., sew). Researchers instructed the participants for 15 twenty-minute individual sessions over a six-week period.

In all conditions, instructional words were presented in the same order (random) and were represented by lowercase cardboard letter sets. However, the letter sets differed given the training focus: (a) Students in the phoneme group worked with individual letter cards; (b) students in the onset-rime group worked with individual letters to form onsets, and two of more letters attached into rimes; and (c) students in the whole word group worked with all letters attached into words.

The researchers hypothesized that instruction at the onset-rime level would better facilitate word reading than training at the whole word or phoneme level. However, at post-test there was no significant difference between the phoneme or onset-rime group, or between the whole word or control group. A second hypothesis was that either the phoneme level or onset-rime level training would be more effective than whole word or control. As hypothesized, both the phonics and onset-rime groups significantly outperformed the whole word and the control groups. The

authors discussed a non- significant advantage of the onset-rime group over the phoneme group to guide further research.

The study is problematic for a number of reasons. One issue is that words in the onset-rime training sessions were not presented in rime families, since the words were presented in the same random order in each training session regardless of condition. Another problem is that the onset-rime group was older than the other students. The authors argued that since the age difference did not result in a skills advantage it was not a confounding factor. However, it possibly indicated a learning difficulty which would put the older group at a disadvantage. As to the authors' discussion of non-significant findings, possibly if the intervention times (a maximum of five hours) had been more extensive or the training groups (48 total participants) had been larger, there might have been a significant effect regarding phoneme versus onset-rime instruction. In the absence of those two factors, the results remain non-significant. Although the results indicated that instruction at the phoneme and at the onset-rime level was more effective than instruction at the whole word level, there is not a clear indication from the study regarding the optimal sub-word unit of instruction, phoneme or onset-rime.

Onset-rime in comparison to phoneme: Optimal sub-word unit. Christensen and Bowey (2005) investigated the optimal sub-word orthographic unit in beginning reading skills. They compared the effectiveness of a decoding program based on onset-rime units with one based on phonic units. A control group received instruction within the context of a whole language approach.

Participants were 116 children with a mean age of 7.2 years. The researchers pre-tested the children for phonemic segmentation, letter knowledge, decoding, sight word recognition and spelling skills. Researchers randomly assigned children within classrooms from groups of three children matched by pre-test scores. Instruction was conducted by trained research assistants within classrooms in small groups of 6 to 8 children for 20 minutes per day for 14 weeks.

Each lesson in the orthographic rime (OR) and grapheme-phoneme correspondence (GPC) programs followed the same basic format. Initially, the new letters for the day were introduced to all of the children in both treatment groups who were instructed to name words that began and ended with the letters. Although children in both instructional groups were taught the same word set each day, the four words in a set were presented in different combinations to reflect instructional focus on the rime or the phoneme. Following instruction, children in both skill groups practiced reading the words in random order. Children were then asked to spell the words in random order and read the words in sentences.

The authors stated that there were significant differences in the results of interim and post tests forming a pattern consistently favoring the GPC group over the OR group and the GPC and OR group over the control group. The authors suggested that the presentation of words in rime patterns was less effective because it allowed the children to only focus on the onset.

The study was of relatively long duration and covered more words (192) and a wider range of orthographic structures than most of the other studies reviewed. Furthermore, the authors attempted to establish equivalent treatment conditions.

However, they stated that children who had difficulty were given additional instruction. The provision of extra help might have resulted in unequal treatment time for students in the two programs. The authors provided anecdotal evidence that in the early stages of the program children in the OR group found reading and spelling tasks easier than children in the GPC group, indicating that treatment might have been extended for the GPC group. Another possible confound was that the OR program seemed to focus on individual phonemes rather than the rime unit as in traditional onset-rime instruction, since the children were instructed to blend the individual phonemes to decode. In addition, the participants were described as advanced beginners (mean age 7.2 years). The authors stated that the differences in treatment gains might not have held for children at a different level of reading proficiency.

Onset-rime in comparison to phoneme: Actual classroom perspective. Juel and Minden-Cupp (1998) investigated beginning reading instruction from an actual classroom perspective. They analyzed reading instruction in four first grade classrooms in two schools over a school year to determine which instructional practices were most effective for beginning readers. The researchers conducted weekly classroom observations of a minimum of one hour, coding their observations in four areas: (a) activities, (b) materials, (c) strategies and (d) linguistic units. In addition to assessment with informal measures of reading progress administered over the course of the school year, the children were also assessed with the Book Buddies Early Literacy Screening (BBELS-an early literacy screening procedure expanded from that used in Book Buddies; Johnson, Invernizzi, & Juel, 1998) and the Word

Reading subtest of the Wide Range Achievement Test-III (WRAT-III; Wilkinson, 1994) in September, December, and May.

According to the authors, the four classrooms differed greatly in their emphasis on phonics and inclusion of onset-rime instruction. Measuring overall student progress across classrooms, the researchers found significant differences at post test on the WRAT word reading subtest and the BBELS. Children in the classroom whose teacher provided a structured phonics curriculum that includes sounding and blending phonemes as well as onset- rime analysis made significantly more progress as measured by the BBELS and the WRAT. September assessments on the measures had indicated no significant differences on classroom mean scores.

An interesting finding was that children across the four classrooms evidenced a treatment by ability interaction, with stronger readers making better progress in the classroom with emphasis on reading of trade books and writing of text rather than phoneme and rime based instruction. The weakest readers, however, responded best to systematic instruction at both the phoneme and onset-rime level.

Regarding onset-rime instruction, the authors emphasized that such instruction should incorporate breaking the rime unit into its phonemic components as well as encoding activities, especially for children who lack necessary letter-sound knowledge. They concluded that using analogies to rimes in key words is not an effective instructional strategy until children have a grasp of sound-symbol relations. They stated, however, that it is not a question of phonics vs. onset-rimes; the most successful teacher of the four classrooms taught both simultaneously. The authors

also found in accord with Goswami and West (2000) that the strategies children used when decoding reflected the strategies emphasized in instruction.

The study is descriptive so results are only suggestive of effective techniques. Teacher effects beyond instructional focus in the different classrooms were a very powerful variable that was not controlled. The author's suggestion that onset-rime be combined with letter-sound instruction, however, is consistent with that of other researchers.

Summary. Research to date has not presented a definitive answer to the question of the optimal size unit of instruction for normally developing beginning readers. Confounds include differential classroom instruction preceding interventions, different reading levels classified as beginning reading, different approaches to onset-rime instruction, and different treatment times within an experiment. Furthermore, certain studies were of short duration and small sample size, others did not control confounding variables. However, it is clear that for normally developing readers, instruction at the sub-word (phoneme and onset-rime) level is more effective than at the whole word level. Furthermore, a minimal level of grapheme-phoneme knowledge is necessary before instruction at the onset-rime level and that introducing beginning readers to decoding at both the phoneme and onset-rime level should be considered. A possible sequence of beginning reading instruction consistent with the developmental model proposed by Stahl and Murray (1994) is instruction in basic alphabet/sound knowledge, followed by instruction at the onset-rime level to establish a word bank, followed by phonemic analysis of mastered words in that bank.

Effectiveness of Onset-Rime Based Instruction for Students with or at Risk for Reading Disabilities

The relative effectiveness of onset-rime instruction for readers with or at risk for disabilities will be examined separately since the path to reading proficiency may be different for such children (Bruck, 1992). Children with reading problems, in contrast to normally developing readers, have severe and persistent difficulties with and fail to achieve age appropriate levels of phonemic awareness (Bradley & Bryant, 1978, 1983; Bruck & Tremain, 1992; National Reading Panel, 2000). In spite of reading progress, Bruck (1992) found that children and adults with dyslexia continued to show deficits in phonemic awareness as compared to normal developing readers at the same reading level. She found that as word recognition improved for children with dyslexia, they acquired appropriate levels of onset-rime awareness but showed persistent deficits in phonemic awareness and in knowledge of spelling-sound correspondence. She stated that this indicates that the path of reading attainment is different for children with dyslexia. Researchers (Peterson & Haines, 1992; Haskell, Foorman, & Swank, 1992; Levy & Lysynchuk, 1997) suggested that since difficulties with phoneme level sub-word and sub-syllabic units may be central to the word recognition failures of readers with dyslexia, the relative effectiveness of remedial reading instruction at sub-word levels other than the phoneme, such as instruction at the onset-rime level should be investigated. A discussion of such research follows.

Onset-rime in comparison to context clue instruction. Greaney, Tunmer and Chapman (1997) investigated the effectiveness of onset-rime compared to context clue based decoding with 36 students (mean age 8.5 years) who had been selected by

their school system for intensive remedial instruction (bottom 1% to 2% of beginning readers). Greaney et al. hypothesized that children with reading problems possess the necessary skills and knowledge to use onset-rime analogies but do not utilize those skills, relying instead on ineffective strategies such as partial letter-sound clues. Therefore, teaching these students to use rime analogies may be a useful first step in helping them overcome their reading problems. Students were matched on word recognition ability as measured by Burt Word Reading Test, New Zealand Revision (Gilmore, Croft & Reid, 1981) with normally developing readers (mean age 6.7 years) who formed a control group.

The researchers randomly assigned each child with reading disabilities to either a rime analogy or a context clue treatment group. They provided the children with 30 minutes of individualized instruction 3 or 4 times a week for 11 weeks. The direct instruction in both conditions generally did not exceed 5 minutes; however, when reading unfamiliar material during the remainder of the lesson, the children were encouraged to use the targeted instructional strategy to decode unfamiliar words.

Greaney et al. (1997) administered five phonological processing measures (sound matching, phoneme segmentation, pseudo-word reading, reading words with common rime units, rime spelling unit identification) to the children with reading disabilities and the controls at pre-and post test. One year follow-up data were also obtained for the children in the intervention groups and a randomly selected sample of the reading-level controls. The follow-up tests were the same as the post tests with the exception of the sound matching test.

At post test, the phonological processing measures indicated that children in both treatment groups performed significantly below normal readers on phoneme segmentation, pseudo-word reading, reading words with common rime spellings, and rime spelling identification. However, the rime analogy group significantly outperformed the context clue training group on the pseudo-word reading, the rime unit identification, and the reading words with common rime spellings tasks. The onset-rime group maintained these differences at one year follow-up.

The authors interpreted the findings as indicating that the rime analogy instruction was an effective procedure for improving the ability of children with reading problems to take advantage of orthographic analogies when reading words containing common rimes. Furthermore, the training in the use of rime spelling units resulted in the development of letter-sound knowledge as measured by the pseudo-word decoding task.

It is unfortunate that the authors compared rime based instruction to a whole language technique (i.e., use of context clues) that is not widely used in the US for students with reading disabilities. The date of the study and the fact that it was conducted in New Zealand explain the authors' choice of treatment. The finding that the students in the rime analogy group developed the ability to decode real words as well as non-words (from instructed and uninstructed rime patterns) is an interesting and important one. The issue of transfer from onset-rime instruction will be discussed in the following section.

Onset-rime in comparison to sequential phonics instruction. Walton, Walton, and Felton (2001) examined the relative effectiveness of a rime based instructional

strategy and a sequential phonics strategy in two experiments and a longitudinal

study. Experiment 1 participants were 77 pre-reading first grade students with weak

pre-reading skills; experiment 2 participants were 66 kindergarten students who were

not screened for pre-reading skills. Since Experiment 1 involved children identified as

at risk for reading disabilities, it will be the focus of this analysis.

The 77 participants were screened to ensure that they could not read more

than one word from a list of eight CVC words. Following the screening test, selected

participants were pre-tested for rhyming ability, phonemic awareness, and letter-

sound knowledge (pre-reading skills). Participants who scored in the bottom 40% on

pre-reading skills were randomly assigned to a rime or phoneme treatment group, or

to a control group. There was also a high performing (top 60%) control group. The

authors provided all students in the two treatment groups with the same pre-reading

instruction (focused on medial, initial and final phoneme identity; rhyming; and letter

sounds) to control for the effects of previous instruction, in accord with Goswami and

West's (2000) belief that classroom reading instruction could determine which

reading strategy was primary.

Walton et al. taught the children in both conditions for 25 minute sessions in

small groups twice a week for 11 weeks. Treatment was similar in format to the

previously discussed Walton and Walton (2002) experiment. The control group did

not receive pre-reading skill instruction and experienced the regular classroom

instruction.

Children were post tested on the same pre-reading skills as well as word

reading ability. Post testing indicated that the children originally assigned to the two

treatment groups on the basis of their poor pre-test reading skills improved those

skills to equal those of the children in the high control group. Regarding the

children's ability to read uninstructed words at post test, children in the rime training

group read significantly more analogy words and equal numbers of letter recoding

words as children in the phonics group. These findings were generally maintained

four months later. The results, according to the authors, indicated the effectiveness of

both a phonic decoding and rime based analogy reading program; however, overall

progress was stronger for the children in the onset-rime training group. In addition,

transfer of skills was stronger from rime based instruction to letter recoding than the

reverse.

The study was important because the researchers compared rime based

instruction with a sequential phonics method and the results indicated the greater

effectiveness of a rime based method. The participants in the onset-rime group also

acquired decoding skills at the phoneme level, in accord with Goswami's (1986,

1993) contention and the research of Greaney et al. (1997). Furthermore, the study

selected pre-readers for participants and trained them in the same pre-reading skills to

control for the effects of prior classroom experience. The onset-rime training,

however, might have been less effective without the pre-reading skill training focused

on letter/sound knowledge which children in both conditions received.

O'Shaughnessy and Swanson (2000) also compared the relative effectiveness

of a rime versus phonics based reading intervention with 45 second grade students

with reading disabilities. Selection criteria included (a) average or above IQ as

measured by the Wechsler Intelligence Scale for Children-3rd Edition (WISC-III) ; (b)

scores below the 25th % on the Woodcock Reading Mastery Tests-Revised (WRMT-R) Word Identification, Word Attack, and Passage Comprehension subtests; (c) scores at least one year below grade level on Curriculum Based Measurement of Oral Reading Fluency (Shinn, 1989); and (d) scores below the 25th % in phonological sensitivity as measured by the Test of Phonological Awareness (TOPA: Torgesen & Bryant, 1994). The authors hypothesized that the children might respond better to remedial strategies using larger phonological units that reduce the memory load required to sequentially blend individual phonemes.

Participants were randomly assigned to a six week phonological awareness (PAT), word analogy (WAT), or math program (control). Instructional sessions were for 30 minutes a day, three times a week for six weeks, implemented by researcher trained paraprofessionals. The authors stated that PAT consisted of direct instruction in sound blending, sound segmenting, and letter/sound correspondence; whereas WAT consisted of systematic, contextualized instruction in rhyming and the compare/contrast decoding strategy to identify unfamiliar words.

At pre-and post test children read instructional words from both programs and were administered tests of phonological awareness, reading, and spelling achievement. Post testing revealed that the PAT group acquired significantly higher levels of phonological awareness as measured by the TOPA. This finding is not surprising since that was the focus of their treatment; also, there was a 14% overlap between the words used on the TOPA and the PAT program, as opposed to 6% for the WAT program. The WAT trained group was better able to read words from the WAT list. However, both groups performed equally when reading words from the PAT list,

indicating transfer of onset-rime decoding skills to the phoneme level for the WAT trained group. This result is consistent with the research of Greaney et al. (1997) and Walton et al. (2001). Although there were no significant differences between treatment groups on the passage comprehension and spelling measures, there were significant differences favoring the onset-rime group over controls.

A problem arises in interpreting the results because the programs differed on dimensions other than instructional focus; for example, the WAT program was strategy based and contextual, whereas the PAT program involved direct instruction and was decontextualized. Another possibly confounding variable is that the PAT trained group received instruction in rhyming.

Savage, Carless, and Stuart (2003) evaluated the relative effectiveness of a rime based, phoneme based, and combination rime and phoneme based program with students (mean age 5.9 years) at risk for reading difficulties in England. The 108 participants were selected (from 414 children in nine schools) on the basis of their relatively low scores on research designed screening measures of pseudo-word (12 words) and real word reading (six words). Within schools, children were assigned to an onset-rime, phoneme, combination treatment, or control group. Pre- and post tests measured rhyme matching, phoneme segmenting and blending, onset-rime segmenting and blending. At post test, the children's pseudo-word reading and real word reading skills were also measured. The authors stated that whole schools were "arbitrarily assigned" to intervention condition. Furthermore, schools themselves decided upon instructional and control groupings based on "social networks" (p. 219).

Intervention sessions were conducted by trained learning support assistants. In the first part of all intervention sessions, children engaged in activities to learn letter-sounds. Following the letter-sound work, children spent 10 minutes on their particular intervention and then 5 minutes on phonological awareness games tailored to phonemes, rimes, or both. In the phonics based program children created words by manipulating consonants printed on wooden blocks to build word towers around a board with a vowel written on it (i.e., a). During the rime intervention, children were given a rime unit work card (i.e., at) and asked to add the appropriate plastic letter (onset) to spell a rime family word in response to a picture prompt. In the mixed program, the phonetic elements of the rime patterns were also emphasized. In the control group, children remained in class and received traditional instruction in accord with the National Literacy Strategy curriculum.

All children in the three intervention groups improved significantly beyond controls on reading skills (onset-rime segmentation and blending, letter-sound knowledge, non-word reading) from pre-test to post test. For six of the variables measured (phoneme segmentation, letter-sound knowledge, rime matching, onset-rime segmentation, reading, and spelling) there were no significant group effects. However, for onset-rime blending and phoneme blending the authors initially reported a significant group effect in favor of the onset-rime trained group.

Several problems exist with the study. The primary problem is that the study lacked random assignment. In fact, the authors admit that group differences in phoneme blending scores at post test favoring the rime trained group might be attributable to pre-test differences. In addition, it is questionable why wooden blocks

were not used for all groups since the authors stated that the use of blocks in the phonics group was a novel element that might have resulted in an advantage for that group. Another issue is that the word building technique used in the phonics intervention encouraged the drawing of analogies between words at the onset-rime level, as new words could be formed simply by substituting initial consonants. In addition, the finding that the combined approach was not as effective as the rime approach might have been due to the fact that letter-sound training began each session regardless of condition. This study, in spite of design limitations, supports the importance of letter-sound knowledge as a prerequisite for onset-rime instruction.

Onset-rime in comparison to sequential phonics and whole word instruction. Levy and Lysynchuk (1997) conducted two experiments investigating the relative effectiveness of onset-rime segmentation (e.g., b-at), onset plus vowel segmentation (e.g., ba-t), phonemic segmentation (e.g., b-a-t), and whole word instruction (e.g., bat). The first experiment involved 100 kindergarten and first grade students described as low achieving who were randomly assigned to the four treatment groups or control. Selected children could not read more than seven words on either the Word Identification Subtest of the Woodcock Reading Mastery Test, the Word identification subtest of the Wide-range Achievement Test (WRAT-R), or the list of instructional words.

The four training groups were all instructed to read the same 32 words. The training in each group differed as to how the words were grouped into sets and by method of instruction. For the onset-rime training, the four words from an individual rime family were introduced together. During the initial trials (Phase 1), the rime

segments were printed in red. Once the child read the 32 words perfectly twice, or after 15 trials, whichever came first, instruction in Phase 1 was discontinued. Phase 2 involved the same procedure with the rime blocked but not color highlighted. Once the child read the 32 words perfectly twice, or after 10 trials, whichever came first, instruction in Phase 2 was discontinued.

The onset plus vowel training followed the same procedure with highlighting and emphasis on the onset plus vowel. The phoneme training was similar, however the words were randomly grouped into sets of four and individual phonemes in a word were printed in different colors. In the whole word condition, the words were randomly grouped into sets of four and presented in black ink.

For purposes of statistical analysis, the onset-rime and the onset plus vowel groups were combined. Mastery of the 32 words was attained significantly more quickly in the combined group than in the phoneme or whole word groups. Experiment 2, which was a replication of Experiment 1 with more seriously delayed second graders, supported those results.

The post test in both experiments was a transfer task that required the children to read 48 real and 48 nonsense words that were not instructed; 24 of the words contained an onset plus vowel in common, 24 contained a rime in common with the original 32 words. Post test results will be discussed in the next section on transfer.

The experiment is impressive with random assignment to treatment groups. IQ and skill level differences were controlled. Treatment materials were equivalent, and the number of participants was large. An important result of the experiment was that

children acquired mastery of instructional material more quickly in the combined onset plus vowel, and rime group.

Foorman, Francis, Winikates, Mehta, Schatschneider, and Fletcher (1997) examined the relative effectiveness of three different reading interventions (synthetic phonics, onset-rime based analytic phonics, or a sight word program) with 114 second and third graders previously identified by the school system as having reading disabilities in 13 elementary schools. The authors assigned 14 intact classrooms to intervention type. Interventions took place for 60 minutes daily during language arts instruction for a full school year. The synthetic phonics program (letter decoding) was based on the Orton-Gillingham approach, the sight word program was commercially available (Edmark Reading Program, 1984), and the analytic phonics program (onset-rime) was researcher designed. Foorman et al. hypothesized that analytic phonics (onset-rime) would result in superior gains in reading achievement compared to synthetic phonics or sight word instruction. The researchers measured and compared student growth in phonemic awareness, word reading, and orthographic processing four times during the school year with individual growth curve analysis.

The results of the study did not support the hypothesized superiority of analytic phonics instruction. Initial results of the growth curve analysis indicated that the synthetic phonics group outperformed the analytic phonics group, which outperformed the whole word group in phonemic awareness, word reading and orthographic processing. However, when SES, ethnicity, gender, and VIQ were added to the models the only treatment effect that remained significant was the phonological

processing superiority of students instructed in synthetic phonics compared to sight word instruction. The major problem with the study was that the assignment method resulted in group differences which when taken into consideration negated the significance of the initial findings.

Summary. The research literature regarding the effectiveness of onset-rime based instruction for children with or at risk for reading disabilities in general is more supportive than the research with normally developing readers. The studies, however, were affected negatively by issues similar to those that compromised research with normally developing readers. Lack of random assignment, unequal treatment times, lack of equivalence in treatments compared, and different approaches to instruction at the onset-rime level make it difficult to conclude with certainty that onset-rime based instruction is the most effective approach to teach students at risk for reading disabilities to decode.

The Levy and Lysynchuk (1997) study was the most rigorous in design. The researchers found an advantage for onset plus vowel and onset-rime instruction regarding the instructional time required for mastery with students with or at risk for reading disabilities in kindergarten through second grade. In addition, a number of researchers investigating the effectiveness of onset-rime instruction for students with or at risk for disabilities found that such instruction facilitated the development of phonic decoding skills (Walton et al., 2001; Greaney et al., 1997; O'Shaughnessy & Swanson, 2000; and Savage et al., 2003). The Walton et al. and Savage et al. studies included sound-symbol instruction as part of the onset-rime intervention. The

importance of knowledge of letter sounds in drawing onset-rime analogies has been previously discussed.

Transfer Problems for Students at Risk for Disabilities

In evaluating the effectiveness of different reading interventions for students with disabilities, evidence that such instruction results in the development of the "self-teaching" mechanism described by Share (1995, 2004) as the "sine qua non" of reading instruction is imperative. Therefore, transfer of decoding skills to uninstructed words should be considered, particularly for students with or at risk for reading disabilities. Students with reading disabilities can show significant improvement on reading measures of instructional material (Foorman et al., 1998; Torgesen, et al., 1997; Vellutino, et al., 1996); however, instructional gains do not necessarily generalize or transfer to other aspects of reading acquisition (Lovett, Barron & Benson, 2003; Lovett, Laceranza, & Borden, 2000; Torgesen et al., 1997). According to Lovett et al. (2003), evaluation of the efficacy of an intervention requires assessment of the transfer and generalization of its effects.

A study by Benson, Lovett and Kroeber (1997) suggested that a deficit in transfer of learning is specific to printed language learning for children with reading problems and does not affect normal readers. They assessed training and transfer effects in children aged seven to nine with and without reading disabilities. Forty-eight children were instructed in two programs; one was a grapheme-phoneme based reading program, the other was a symbol note music program. The authors post tested the children immediately following and one week after instruction on targeted and transfer information. Results indicated that although normal readers transferred

knowledge from both the reading and music instruction, the students with reading disabilities only transferred knowledge from the music instruction.

Transfer effects as measured in aforementioned studies involving students with or at risk for reading disabilities. Regarding transfer effects in the articles discussed in the previous section involving instructional effects for students with or at risk for disabilities, the evidence provided relative support for onset-rime instruction. A second aim of O'Shaughnessy and Swanson (2000) was to determine which approach; phoneme level (PAT) or onset-rime level (WAT) was most effective in promoting transfer of learning to uninstructed material. They predicted that children receiving onset-rime training would be better able to generalize what they had learned to uninstructed material. To measure such transfer, each student's ability to read instructional words from the alternative program was tested. The WAT group performed significantly better than the PAT group reading the WAT training words, and performed as well reading the PAT training words, indicating transfer from onset-rime training to phonic decoding, but not the reverse. Other measures of transfer included the Letter Word Identification, Word Attack, and Passage Comprehension subtests of the Woodcock-Johnson Reading Mastery Test-Revised. Both training groups evidenced significant differences over controls on the standardized measure of word attack skills. The WAT trained group showed a significant improvement over the control group on passage comprehension and spelling, but training group differences were not significant.

Levy and Lysynchuk (1997) also investigated the relative transfer effects of the four different reading instruction techniques used in their study: onset-rime, onset

plus vowel, phonemic segmentation, and whole word instruction. The post test was a transfer task that required the children to read 48 real and 48 nonsense uninstructed words; 24 of the words in each group contained an onset plus vowel in common with the original 32 words, 24 contained a rime in common. There were no significant differences between the phoneme and the onset and rime level groups for transfer of skills, but the whole word group performed significantly below the other instructional groups.

Levy and Lysynchuk (1997) stressed the importance of mastery learning in acquiring transfer, claiming that generalization to new words and non-words was 40% to 65% on the child's first encounter, irrespective of the instructional method. They argued that the strong transfer effects across participants was the result of consolidated learning in every condition, however this was not tested directly. It should be noted that measures of transfer were limited to novel words from instructed onset plus vowel, and onset- rime patterns.

A major problem with the study as far as comparing transfer effects is that the treatment times were different for the four groups. The design of the experiment, which called for the ending of training in either phase after two perfect readings of the 32 treatment words, resulted in unequal duration of treatment. Because mastery was quickest in the onset plus vowel and onset-rime groups, those groups had significantly fewer sessions or encounters with the training words. Had the training times for the groups been equal, the authors might have found significant differences in transfer to uninstructed material.

Walton et al. (2001) also measured the relative transfer effects of a rime based reading strategy versus a phoneme-based strategy. At post test students were required to read unfamiliar words that could be successfully decoded with either a sequential decoding or a rime analogy approach. Children trained in rime analogies read significantly more analogy decoding words than the students trained in letter recoding. Also, children in the rime analogy group read equal numbers of sequential decoding (letter recoding) words as children in the letter recoding group. The authors stated that experience with the rime analogy training resulted in increased ability to recode words by letters, but experience with the letter recoding did not improve students' ability to use rime analogies to decode. According to the authors, the results suggested a relationship between experience with reading by rime analogy and transfer to the later development of phonic skills, in keeping with the theory of Goswami (1999).

Finally, Greaney et al. (1997), investigating the effectiveness of onset-rime based instruction with 36 students (mean age 8.5 years old) with severe reading problems, also found that rime analogy training resulted in the development of letter-sound knowledge as measured by non-word decoding. The authors stated that the initial focus on teaching orthographic units corresponding to rimes was a very useful first step in making readers with disabilities more aware of sub-lexical relationships between written and spoken words, and in helping them to overcome their tendency to focus on boundary letters at the expense of medial information.

Regarding the above discussed studies investigating transfer of skills following reading instruction for students with or at risk for disabilities, onset-rime

level instruction seemed to result in superior transfer of skills than instruction at the whole word or phoneme level for students with or at risk for disabilities. The transfer effects measured, however, were generally limited to initial gains in phonic skill development (Walton et al., 2001; O'Shaughnessy and Swanson, 2000; Greaney et al., 1997) or to reading words from instructed onset plus vowel or rime patterns (Levy and Lysynchuk, 1997). Although O'Shaughnessy and Swanson (2000) measured comprehension and spelling gains, differences between training groups were not significant.

     Basis of the transfer deficit. Hanley and Reynolds (1997) in England investigated the basis of the transfer deficit of students with dyslexia following reading instruction. The authors hypothesized that the deficit resulted from the children's inability to use analogies in reading. To test this hypothesis they measured student's ability to transfer knowledge of a clue word to decode new words that could be read by analogy at the onset-rime level. In a series of two experiments, nine children (mean age 10.5 years) with dyslexia (reading age at least 2.4 years behind chronological age) and nine normal readers matched by reading age were participants. The results of the experiments indicated that the children with dyslexia read significantly fewer words that were analogous to the clue words than the younger readers matched by reading age. The authors interpreted the results as indicating that although students with dyslexia have some ability to draw analogies to clue words, they are much less able to do so than normal readers. Hanley and Reynolds pointed out that because the students with dyslexia were matched by reading age to the comparison groups, their difficulty drawing analogies was not simply a consequence

of their reading ability level. According to the authors, the failure of children with dyslexia to use analogies to read new words limits the development of their sight vocabulary. Hanley and Reynolds stated that difficulties in making analogies may be one of the prime reasons students with dyslexia find it so hard to learn to read. Of interest is that the authors stated that anecdotal evidence indicated that the students with dyslexia noted the visual similarities between words but seemed unaware that there would be a corresponding similarity in pronunciation.

In contrast with Hanley and Reynolds' (1997) theory that children with reading disabilities have limited ability to draw analogies in reading, Greaney et al. (1997) suggested that such children have the ability to draw analogies to decode successfully, but do not use that ability. The question then is whether rime based instruction can improve students' ability to analyze words at the onset-rime level and transfer that ability to decoding unfamiliar words.

Trainability of transfer skills following onset-rime instruction. Lovett and colleagues at the Hospital for Sick Children in Toronto were also interested in this question. They conducted a number of studies specifically investigating transfer for students with severe reading disabilities following decoding instruction at the onset-rime level. These studies were undertaken in response to prior research at the hospital indicating a lack of transfer of decoding skills following instruction for students with reading disabilities (Lovett, Ransby, & Barron, 1988; Lovett, Ransby, Hardwick, Johns, & Donaldson, 1989; Lovett, Warren-Chaplin, Ransby, & Borden, 1990). In these earlier studies, researchers had randomly assigned children with severe reading disabilities to either a whole word or phonics program with another group as control.

Although the results of the various experiments indicated that children in treatment

groups were successful in mastering instructional content, they did not improve on

measures of transfer to uninstructed material. Lovett et al. (1990) speculated that

children's word recognition gains were not based on new knowledge about grapheme-

phoneme correspondence, but on the acquisition of specific lexical knowledge about

individual words. They hypothesized that the lack of transfer may result from the

failure of the children with reading disabilities to use sub-word units such as rimes to

draw analogies as a basis for transferring their new lexical knowledge. Lovett et al.

(1990) suggested that a different approach to remedial decoding may be necessary to

effect transfer of decoding skills to uninstructed material. Specifically, they suggested

research on the transfer effects of remedial decoding instruction based on onset-rime

analysis.

Lovett, Borden, De Luca, Laceranza, Benson, and Brackstone (1994)

measured the transfer of reading skills of 62 children with severe reading disabilities

between the ages of 7 and 13 following instruction in two programs which targeted

generalization or transfer. One training program was the Phonological and Blending

/Direct Instruction Program (PHAB/DI) focused on letter-sound units; the other was

the Word Identification Strategy Instruction Training (WIST) focused on the larger

rime unit. After 35 hours of individualized training, children in both groups

demonstrated significantly improved letter-sound knowledge, decoding abilities, and

word identification skills over controls. However, the different intervention

approaches led to different patterns of transfer. The PHAB/DI program led to greater

generalization in the phonic domain (i.e., nonsense word identification) and the WIST

training program resulted in greater transfer to real word reading (both regular and exception). Therefore, the researchers stated that they found broader transfer effects for the WIST trained group.

Lovett and Steinbach (1997) subsequently compared the performance of 122 students with learning disabilities aged 7 to 12 years of age instructed in the PHAB/DI and WIST programs to see if there were differential effects by the age of the students. Results replicated those of the Lovett et al (1994) study, students in both PHAB/DI and WIST programs made significant progress over controls regarding transfer to uninstructed words. There was no grade effect; nor was there an interaction of grade and program. However, only the WIST trained students significantly improved their ability to identify exception or irregular words. This finding is consistent with the earlier conclusions of Lovett et al. (1994) that the WIST program resulted in transfer to a broader range of real English words than the PHAB/DI program.

Lovett, Laceranza, Borden, Frijers, Steinbach, and DePalma (2000) further investigated transfer of reading skills after instruction with the PHAB/DI and WIST programs. They looked at whether a combination of the training programs would result in greater gains than either program alone and if so, what order of presentation would be most effective. The 85 participants were children and adolescents with severe reading disabilities ranging in age from 6 years, 9 months to 13 years, 9 months.

The researchers measured mastery of specific content as well as transfer for both real and nonsense words. Participants in all treatment conditions evidenced

significant treatment gains relative to controls; gains were greater in the combined treatments than the single ones. Regarding transfer, all four groups achieved significant transfer over controls. Furthermore, children who received both PHAD/DI and WIST regardless of the sequence demonstrated greater transfer to regular and irregular, real and nonsense words. The authors stated that more effective training for transfer occurred when word identification training used both levels of sub-syllabic segmentation in the remediation of learning disabilities. The authors also noted the importance of program elements promoting the use of multiple decoding strategies and self-monitoring techniques.

Regarding transfer effects in these studies at the Hospital for Sick Children, it is difficult to separate the relative contribution of the different elements included in the PHAB/DI and WIST programs. For example PHAB/DI, in addition to emphasis on the phoneme, also included direct instruction; WIST, in addition to the onset-rime emphasis, included strategy instruction. Furthermore, PHAB/DI had a rhyming component; WIST had a variable vowel component. The research, however, is important in that it indicated that transfer effects can be affected for students with learning disabilities given intensive instruction. It should be noted that the WIST program with emphasis on onsets and rimes resulted in transfer to regular and exception words, whereas the PHAB/DI program alone resulted only in transfer to regular words.

Measuring transfer at the individual level. As a result of the finding that a combined program that included PHAB/DI and WIST was more effective than either program alone, researchers combined the PHAB/DI and the WIST program into the

PHAST program (Phonological and Strategy Training). The PHAST program was used by Compton, Olinghouse, Elleman, Vining, Appleton, Vail, et al. (2005) to investigate transfer of skills for students with reading disabilities. Since prior research using group designs indicated limited transfer of skills following decoding instruction, Compton et al. also investigated individual student differences in transfer of decoding skill gains after instruction with the PHAST program.

Participants were 53 children in grades three to five identified by their school system as having a learning disability with an IQ/achievement discrepancy formula and receiving special education resource services. Children were assigned by their special education teachers to groups of three to five children. Groups were then randomly assigned to PHAST training or standard special education control conditions. Pre-test measures included an estimate of full-scale IQ, a measure of receptive vocabulary, and measures of phonological awareness, phonological memory, and rapid naming. Pre-test and post test assessments included measures of real and non-word reading efficiency, passage reading accuracy, fluency, and comprehension.

Regarding the overall effectiveness of the PHAST program, significant group differences favoring the children receiving the PHAST training over controls were limited to performance on measures of word attack and word-reading efficiency. The authors stated that these results were consistent with previous studies indicating limited transfer of decoding skills gains to other areas when using group comparisons.

To further investigate transfer, the authors derived an optimal learning curve for the PHAST program based on instructional words and when they should be

mastered. Then they developed a 50 word assessment based on that curve. They hypothesized that transfer of decoding skill gains would be greatest for children whose individual growth curves most resembled the optimal one. Compton et al. (2005) found that the relationship between a child's individual growth curve and the optimal growth curve was significantly associated with gains on standardized measures of word attack and word identification; speeded word attack and word identification; and text reading accuracy, fluency, and comprehension. They concluded that children whose growth curve most resembled the optimal curve evidenced the greatest likelihood of transferring decoding skills gains to other areas of reading. They also argued that the most appropriate unit of analysis of transfer effects of decoding instruction is the individual as opposed to the group. The findings of Compton et al. (2005) regarding the transfer of learning by individual students supports the contention of Levy and Lysynchuk (1997) that mastery of instructional content is required for transfer to occur. The argument that transfer be examined on an individual basis is an important one.

Summary. Future investigations into the relative effectiveness of decoding programs for students with disabilities should always include measures of transfer since the attainment of transfer is the true test of the effectiveness of any intervention (Share, 1994, Lovett et al., 1994). Furthermore, transfer should either be investigated at the individual level or, if investigated at the group level, should be further analyzed in relation to individual student mastery of instructional material (Compton et al., 2005). Also, since transfer is dependent upon mastery (Levy & Lysynchuk, 1997; Compton et al., 2005), and since mastery for students with reading disabilities was

attained more quickly with onset-rime instruction than whole word or phoneme level instruction (Levy and Lysynchuk, 1997), one might argue that if instructional time is held constant, onset-rime instruction is more likely to promote transfer.

Color Coding to Enhance Mastery and Transfer

   Need for visual support of rime patterns. If onset-rime instruction is an appropriate method to approach decoding instruction for students with reading problems due to its assumed accessibility, relative effectiveness, and superiority in affecting limited transfer; then the onset-rime instructional method must incorporate techniques that encourage children with or at risk for disabilities to draw analogies. Although research indicated that children with or at risk for disabilities can be taught to successfully use onset-rime analogies to decode, research also indicated that such children do not do so without instruction encouraging such analysis.

   Juel and Minden-Culp (1998) concluded from their classroom observations that children in the lowest reading groups had difficulty seeing what they referred to as the "chunks" or onset-rime patterns in words in spite of instruction incorporating onset-rime emphasis. Lovett et al.(1990), and Hanley and Reynolds (1997) suggested that the lack of transfer of reading skills may be the result of the failure of children with reading disabilities to use sub-word units such as rimes to draw analogies as a basis for transferring their new lexical knowledge. Greaney et al. (1997) and Goswami (1999) suggested that children with dyslexia lack spontaneous rime generalizations but can be trained to use rime analogies.

   Use of color to provide visual support. Possibly the limited transfer and failure of students with or at risk for reading to use analogies about rime units to

decode is due to the fact that the rime is not salient enough for them to draw generalizations. One way to improve the effectiveness of onset-rime instruction is to make the rime patterns more explicit with a color-coding system that highlights those pattern similarities.

A number of researchers have investigated the use of color to improve learning for students with disabilities. Goodman and Cundick (1976) investigated the effectiveness of using color cues to teach 48 children in grades 2-4 to identify unfamiliar Hebrew letters. Twenty-four of the students had been identified as having a reading disability; twenty-four had been determined as having average achievement in reading. All 48 students were taught to identify half of the Hebrew letters in a color-coded condition, and half of the symbols in a black print condition. The authors found that for all of the participants, regardless of reading achievement, there was a significant improvement in their ability to read the symbols when the symbols were color-coded. However, this initial advantage was negated when the color-coding was dropped from the symbols. The researchers concluded that instruction using color-coding should include a progressive fading of color cues.

Doyle (1982) explored the effectiveness of a color-coding technique in remediation of the reversals of letters p, b, d and q. The participants were 23 students in grades 3-5 who had been identified as having learning disabilities by their school system and who had been screened for reversal problems. Students were pre-and post tested for number of target letter reversals while reading CVC words. Students were matched by IQ and assigned either to a treatment group where they were instructed to identify the four letters with a color-coding system or to a control group where they

were instructed without color-coding. Each student received three 15 minute group sessions that involved reading and writing the words printed with (experimental) or without (control) color-coding. After the group lessons, each participant received three individual sessions reading words from the pre- and post test list of words, with or without color-coding, as appropriate. The results of the experiment indicated that the color-coding instruction was not differentially more effective in remediating the reversals of the letters p, b, d and q.

In two single subject experiments Van Houton and Rolider (1990) examined whether the use of what they termed a "mediated transfer procedure" using color cues could facilitate the learning of number identification and simple multiplication facts for students with learning disabilities. In the first experiment three children aged six, seven, and eight were taught to label digits using a color mediation procedure that involved the association of each numeral with a color and chaining the name of the color to the name of the numeral (e.g., red-seven). The training resulted in rapid learning for all three students, and abrupt dropping of the color prompt did not produce a decrease in accuracy. In the second experiment the same procedure was used to teach multiplication facts to two students ages 9 and 11. Again the training resulted in rapid learning with no decrease in performance once the color prompts were dropped. The researchers suggested that a similar color-coding procedure be used to teach other material such as identifying letter names and sounds.

Research on the use of color cues to enhance the mastery and transfer effects of beginning reading instruction, in particular onset-rime based interventions, is limited. Levy and Lysynchuk (1997) used color to highlight the rime in their

previously discussed intervention. The targeted rime was printed in red while the onset was printed in black. After 15 days of training the color was dropped but the words remained blocked by rime pattern for the remaining 10 days of training. The results indicated that students attained significant improvement in their ability to decode the instructed words and uninstructed words from the targeted rime patterns.

In a later study, Levy (2001) investigated the effects of visually blocking and/or color coding the rime unit with 80 low achieving second grade readers. The intervention targeted the decoding of 48 words from 12 rime families. There were four training conditions formed by the combination of two variables: blocking and highlighting. The results indicated that blocking the rime led to faster learning of targeted and transfer words. The author concluded that the findings supported the view that students with reading disabilities failed to see the repeated patterns as they occurred distributed across learning without support. However, when the unit was made more visible through blocking, the children processed larger units. According to the author, visual pattern support within the print itself can help the struggling readers read more normally.

> First… blocking words with shared orthographic units appears to be sufficient to help these children to "see" and process letter patterns more rapidly. Second, segmentation methods that highlight the larger units, and relate the orthographic unit to its pronunciation, may be important in abstracting and representing larger units so that they can be retrieved for use in reading new words containing those units. This latter suggestion requires further testing. (p. 376).

Regarding the impact of color-coding in her study, Levy found that in the unblocked highlighted condition, when the rimes were scattered across the set of 48 words, assigning distinct colors to each rime added no benefit over the unblocked, unhighlighted condition. Levy also found that color in combination with the blocking did not improve learning over blocking alone. It should be noted, however, that when the words were presented in the blocked, highlighted condition, all rimes were highlighted in red. Levy does not explain why the distinct colors were dropped when the words were blocked as well as highlighted.

Summary. Research investigating the use of color cues to improve the achievement of students with learning disabilities is limited and is not definitive regarding its effectiveness. Goodman and Cundick (1976) found color-codes effective in teaching Hebrew letters, and Van Houton and Rolider (1990) found that instruction with color-coding improved children's ability to identify numbers and learn multiplication facts. Doyle (1982), however, determined that training with color cues did not decrease children's letter reversals. In investigations into the effectiveness of color and onset-rime instruction, Levy and Lysynchuk (1997) found that accenting the rime with red print led to faster learning, but Levy (2001) found that the use of red highlighting of the rime was no more effective than simply blocking the rime unit. She also found that assigning distinct colors to rime patterns did not improve outcomes when instructional words were not introduced by rime family.

Rationale for Study

Guided by research findings that onset-rime instruction is developmentally more appropriate and accessible than instruction at the phoneme level, that onset-rime

based instruction is effective in learning instructed words for students with reading problems, that transfer of acquired reading skills to uninstructed material is a problem for such students, and that visual support emphasizing the rime unit enhances mastery as well as transfer; this study investigated initial learning as well as transfer effects following instruction at the onset-rime level using a color-coding system for each rime pattern. Color-coding was used in the intervention in spite of the finding of Levy (2001) that color did not enhance the effect of visual blocking of the rime patterns. The rationale is that the color-coding system in this study is systematic, organized across rime pattern and across short vowel (i.e., each short *a* rime pattern will be a separate shade of blue; each short *e*, a separate shade of red). Furthermore, Levy suggested research investigating approaches linking onset-rime units to their pronunciation, which the color-coding used in this intervention does. The following hypotheses were investigated:

1. A color-coded, onset-rime decoding intervention will be effective in improving performance on taught words for students with or at risk for reading disabilities.

2. Students will transfer their ability to decode training words to novel short vowel words from instructed rime patterns (near transfer).

3. Students will transfer their ability to decode training words to novel short vowel words from uninstructed rime patterns (far transfer).

4. Students will maintain their decoding skills one week and one month after instruction ends.

CHAPTER 3 Method

In this chapter, I outline the methodology for this study. The following methodological elements are described: (a) the setting, and the participants and selection process; (b) the independent variable and training materials; (c) the dependent variables and their measurement; (d) the procedure, including the phases of baseline, training, and post training; (e) the reliability measures and findings; and (f) the experimental design.

Setting and Participants

School Setting

The participants attended an elementary school in the Eastern United States. The school population was predominately middle class (15.2% received Free and Reduced Meals: FARMS) with moderate ethnic diversity (65.3% White, 14.4 % African American, 6% Hispanic, and 14% Asian). The total first grade population was 87 students.

Participant Permission

All appropriate consent was obtained before screening and selection of participants. Prior to screening, Dr. Speece, my advisor and I sent an introductory letter (Appendix A) and permission form (Appendix B) to parents of all first graders. The letter stated that the intervention targeted students at risk for reading problems. A child assent script (Appendix C) was read to each child prior to screening. Dr Speece and I were available to answer any questions of the parent/guardian regarding the study.

Participant Selection

Participants were selected from those 32 students who received parental permission. A large number of parents (55) did not return the permission slips, possibly in part because the letter to parents stated that the intervention targeted children at risk for reading problems.

Students who received parental permission were screened for inclusion in the intervention. The original selection criteria were (a) that the children could identify all of the letters (upper and lower case) used in the intervention with 100% accuracy, (b) that the children could provide all of the consonant sounds included in intervention words, and (c) that the children could not decode the CVC/CVCC words included in the intervention with accuracy above 10%. Screening measures are presented in Appendix D.

The original selection criteria were modified as a result of student performance during screening. The criterion that students be able to read fewer than 10% of the instructional words correctly was too stringent to identify an adequate number of appropriate participants. Therefore it was changed to 15% of instructional words. Also the criteria that children know all of the letter names and consonant sounds were also unrealistic, especially in light of the requirement that children be able to identify less than 15% of the instructional words. Therefore, selection criteria were modified to knowledge of 80 % of the letter names and 75% of the consonant sounds associated with those letters.

From the 32 children who were granted parental permission, six students were selected for the intervention. The children selected were deemed to be the most at risk first graders on the basis of screening performance, confirmed through teacher discussions. Of the six selected students, one was not included in the final study because of excessive absences from school; another was excluded because winter break interrupted her intervention. The four remaining students were members of two classrooms.

Table 1 presents information concerning the performance of participants in relation to the entire sample of first graders receiving parental permission.

Table 1

Participants in Comparison with all First Graders

Variable	John	Tammy	Arthur	Maria	Group M (SD)
Letter Identification (max=24)	21	20	20	22	22.47 (1.70)
Consonant Sounds (max=22)	17	19	20	20	20.25 (2.17)
Instructional Words (max=44)	2	5	6	6	19.31 (11.69)
Chronological Age as of Sept.15, 2006	6.3	6.1	6.3	6.0	N. A.

Note. Group is students receiving parent permission (N=32). Letter identification measure contained 24 total upper and lower case letters used in instructional words.

Participants

  John. John, a male Caucasian, was 6.3 years old in September of first grade. John's teacher stated that he was often lost during independent work but rarely asked for teacher help. She said that he has difficulty completing assignments in the prescribed time, especially during language arts. John had been recommended by his first grade teacher for a pre-referral evaluation because of concerns about his reading progress. As a result, he was receiving 10-15 minutes of individual instruction targeting sight word instruction four times a week with a para-educator or parent volunteer.

  At screening, John read 2 of the 44 instructional CVC words correctly. On the Word Attack subtest of the Woodcock-Reading Mastery Test (WRMT-R, NU) administered at pre-test, John earned a Raw Score of zero, which translated to a Standard Score of 80 and placed him at the 9th percentile (grade-based norms).

  Tammy. Tammy, a Hispanic female, was 6.1 years old in September of first grade. According to her teacher, Tammy was aware of her lack of reading skills and often became tearful during language arts activities. The teacher stated that Tammy's mother was very concerned about Tammy's lack of progress in reading and visited the classroom and called the teacher frequently. Tammy was born in the United States and had no difficulty understanding English. Her parents spoke English and Spanish at home. Tammy's teacher had recommended that she have a pre-referral evaluation due to reading problems; and as a result, Tammy was receiving 10-15 minutes of individualized instruction on sight word recognition 4 times a week with a para-educator or parent volunteer. At screening, Tammy read 5 of 44 instructional CVC

words correctly. On the Word Attack subtest of the WRMT-R, NU administered at pre-test, Tammy earned a Raw Score of zero, which translated to a Standard Score of 77, placing her at the 6th percentile (grade-based norms).

Arthur. Arthur, a male student of mixed race, was 6.3 years old in September of first grade. His teacher said that he was withdrawn and unfocused during language arts and that he preferred working alone on the computer to group reading activities. Due to concerns about his attention and progress in reading and math, Arthur's teacher had sent a request for academic support to the pre-referral team. However, Arthur was not yet receiving any additional instructional support. At screening, Arthur read six of the 44 instructional CVC words correctly. On the WRMT-R, NU administered at pre-test, he earned a Raw Score of zero, which translated to a Standard Score of 72, placing him at the 3rd percentile (grade-based norms).

Maria. Maria, a Hispanic female, was 6.0 in September of first grade. According to her teacher, she had behavior problems that sometimes interfered with her ability to benefit from instruction. Her teacher said that Maria enjoyed working alone at the computer or writing and illustrating stories, but resisted other reading related activities. Maria had been recommended to the pre-referral team earlier in the school year for emotional and behavioral issues. A positive reinforcement plan was initiated in the classroom that, in the teacher's opinion, greatly improved Maria's behavior. At screening, Maria read 6 of the 44 instructional CVC words correctly. On the Word Attack subtest of the WRMT-R, NU administered at pre-test, she earned a Raw Score of 3, which translated to a Standard Score of 98, placing her at the 44th percentile (grade-based norms).

None of the four participants were identified as having a disability under the Individuals with Disabilities Education Act (IDEA). However, no students in the first grade had been so identified as of January 1, 2007.

Classroom Reading Instruction

The county curriculum for first grade emphasizes developing phonemic awareness and phonics skills. The curriculum also requires that children be provided instruction on recognizing high frequency words. Both teachers primarily used a Guided Reading Approach in their classrooms, requiring children to read books classified by grade-level aloud as errors were recorded. The teacher in John and Tammy's classroom also provided direct instruction in phonics during group lessons. Arthur and Maria's teacher said that she did not directly teach phonics but that she sometimes focused on phonics during the morning message. Although onset-rime instruction is part of the published curriculum, both teachers stated that it was not emphasized in their classroom. Arthur and Maria's teacher added that working with "chunks" was part of a computer program available to her students as a choice during station time. Language arts instruction was for 135 minutes daily, 90 minutes in the morning for reading and 45 minutes in the afternoon for writing. There was a part-time reading teacher and a part-time para-educator who provided support to all the first grade classrooms. The children missed a portion of language arts instruction to participate in the study.

All of the children had attended kindergarten in the school. The kindergarten curriculum emphasizes letter identification, high frequency words, phonemic

awareness, and phonics. Kindergarten instruction introduces consonants, consonant blends, vowels, and vowel combinations according to the published curriculum.

Intervention Setting

The training sessions were in an empty classroom down the hall from the first grade classrooms, limiting distractions and affording privacy to the students. Also, conducting the training outside the classroom assured that the training did not generalize to the other participants. The participants and I sat at right angles to one another at a three cornered table. This arrangement allowed the recording of data without the child being aware of his/her errors.

<center>

Pre-test/ Post Test Measure/Woodcock-Reading Mastery Tests-Revised,

Normative Update (WRMT-R, NU)

</center>

The WRMT-R, NU is a battery of six individually administered tests to assess the development of reading skills of individuals in kindergarten through 75 years old (Salvia & Ysseldyke, 2004). The following two subtests from the battery were administered to students selected for training at pre-test and at post test (one month after intervention) to provide a standardized measure of their reading skills: (a) Word Identification (measuring skill in pronouncing words in isolation; and (b) Word Attack (measuring skill in using phonic and structural analysis to read nonsense words). Also, a Basic Skills Composite score was calculated based on performance on those two subtests. Grade-level norms were used to calculate percentile ranks and standard scores. The test is appropriately and adequately normed, and evidence for internal-consistency reliability as well as validity is good (Salvia & Ysseldyke, 2004).

Independent Variable and Instructional Materials

The independent variable was a color-coded, onset-rime reading intervention targeting the decoding of short *a* and short *e* CVC/CVCC words. The instructional materials were Books 1-8 of the *Rime to Read* series for beginning readers (Hines & Klaiman, 2002). The 20 book series is organized by onset-rime patterns with each rime pattern coded a different hue controlled by short vowel (i.e., all short *a* patterns are a different shade of blue; short *e* patterns, a different shade of red). Four rime patterns per short vowel are introduced and practiced in separate books. A list of the titles and rime pattern words from books 1-8 is included in Table 2. The books are cumulative with mastered rime patterns reviewed in subsequent books. Rime family words from previous books are color-coded throughout the series.

I developed the materials based on my experience as a teacher of students with reading disabilities. I found that instruction based on rime patterns was often effective with students who had not responded to other remedial approaches. I incorporated the color-coding of rime patterns to enable the students to overcome their tendency to confuse similar rime patterns. I selected the rime patterns used in the instructional materials based on the number of words in a given pattern that were familiar in meaning to children and could be combined to create an understandable and appealing story.

The title of each book introduces the main character whose name/identity contains the rime (e.g., *Pat, The Pet)*. All illustrations on the cover and throughout the books are printed in black and white, with the exception of depictions of the title characters who are dressed in the same color as the corresponding rime pattern to

serve as keywords. When title characters return in subsequent stories, they retain their color coding. Sample pages from Book 6: *The Pet* including the cover page and a review page are presented in Appendix E.

Table 2

Book Titles and Corresponding Rime Words

Dan	Pat	Dad	Pam and Sam
Dan	Pat	Dad	Pam
man	cat	pad	Sam
ran	rat	had	am
van	bat	sad	jam
can	sat	mad	ham
	at	bad	
The Pet	**Ben**	**Ned**	**Nell**
pet	Ben	Ned	Nell
met	ten	bed	bell
get	den	red	well
wet	men	fed	fell
let	pen		tell
bet			
yet			

Dependent Variables

Three Dependent Variables

There were three dependent variables. The first was the ability to read instructional CVC/CVCC from the eight short *a* and *e* rime patterns; the second was the ability to read uninstructed short *a* and *e* CVC/CVCC words from instructed rime patterns (near transfer); the third was the ability to read short *a* and *e* CVC/CVCC words from uninstructed rime patterns (far transfer).

Measurement

There were three measures (Appendix F), one for each of the dependent variables. Measure 1 was 20 of the 44 CVC/CVCC included in the intervention materials, randomly selected without replacement. Five versions of the measure were prepared. Words were in random order without color-coding. This measure of instructional words was administered multiple times during baseline, multiple times following training to measure instructional gains, and at one week and one month maintenance. The data collection method was a frequency count scored as to the percentage of words read correctly.

Measure 2 was eight near transfer words from instructed rime patterns, one per rime pattern, randomly selected from a list of possible words. Measure 3 was six far transfer words from uninstructed rime patterns, three short *a* and three short *e* words, randomly selected from a list of possible words. One version of each of these two measures of transfer was prepared. Words were in random order without color coding. The measures were administered once before the intervention, once following

training, and at one week and one month maintenance. The data collection method

was a frequency count scored as to the percentage of words read correctly.

Data Analysis

In keeping with single subject design, data regarding the effectiveness of the

intervention are presented graphically for visual analysis. The number of instructional

words read correctly is presented in a line graph detailing each child's performance

during baseline, post intervention, and at the two maintenance points. The number of

near and far transfer words read correctly at baseline, post intervention, and at

maintenance are presented for each student in bar graph form.

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Operational Definitions

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A word read correctly refers to the dictionary pronunciation of a word without

segmentation. Self-corrections were counted as correct. Mispronunciations due to

speech impediments, dialects, or accents were not counted as errors. If a child did not

respond after approximately 5 seconds, he/she was asked to proceed to the next word

and the word was scored as incorrect.

Successful completion of instruction required completion of books 1-8 of the *Rime to*

Read series. To complete a given book successfully, the child did not require the

correction procedure more than 5 times in books 1-4, or 8 times in books 5-8. If the

correction procedure was required more than the allowed times, the book was reread.

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Experimental Design

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Single Subject Design

I used a single subject design (Tawney & Gast, 1984) for this study in accord

with the suggestion of Compton et al. (2005) that transfer of learning following

reading instruction for students with disabilities be examined on an individual basis. The single subject design allowed adaptation of instruction if an individual student had difficulty mastering the instructional materials.

The use of a single subject design also allowed the investigation of variability in student response since understanding such variability is key to finding effective remediation for students who are non-responders to reading remedial programs. A purpose of single subject design is to discover and carefully examine variability, instead of attempting to control it through randomization and statistical procedures (Neuman & McCormick, 2000). Since it has long been recognized that struggling readers are not homogenous, a single subject design allows researchers to systematically determine whether a particular intervention is effective, and for whom, since individual participants may respond differently (Neuman & McCormick). In addition, repeated measurement is a more reliable indicator of performance than a single assessment (Neuman & McCormick).

Multiple Probe across Participants

Specifically, the intervention followed a multiple probe design, a variation of the multiple baseline design. The designs are similar in that the independent variable is systematically introduced to one participant at a time. However, with a multiple probe design, baseline data are not taken continuously for all participants. The multiple probe design diminishes the internal validity threat of extinction. Tawney and Gast (1984) stated that the extension of baseline measures may result in potentially aversive experiences for learners due to boredom and fatigue. In a pilot

study the baseline performance of one participant deteriorated over time, possibly as a result of frustration and boredom with the numerous multiple baseline measures.

In a multiple probe design a baseline probe is obtained on each participant and once completed, a series of probes is taken with Participant 1 (S1) until stability is established. Baseline probes on remaining participants are not repeated until S1 meets criterion. At this point, an additional probe is collected for each remaining participant and then enough consecutive probes are completed with S2 so that there is at least one more consecutive probe than was obtained with S1. Once S2 meets criterion an additional baseline probe is taken on remaining participants. This procedure is continued until all participants have met criterion.

Multiple baseline designs have the advantage of not having to return to baseline (an impossibility once learning has occurred) to demonstrate experimental control, as required in reversal or withdrawal designs. Rather, experimental control is established by systematically introducing the independent variable into a series of behaviors, conditions, or subjects in a staggered manner. If change in the independent variable occurs when the intervention is introduced, such control is established (Tawney & Gast, 1984).Although the multiple probe design is not as strong as the multiple baseline design because of the increased threat of maturation and history, establishing baseline prior to the introduction of training for each participant allows functional control (Tawney & Gast, 1984).

Procedure

Baseline

I picked the children up from their classroom and walked them to a quiet room where I collected baseline data on the measure of instructional words. The only instruction I gave to each student was "I want to see how many of these words you know. Just take your time and do your best. Tell me the name of each word as I point to it". The measure was administered on an untimed basis. Responses were not acknowledged as either correct or incorrect. Once baseline was established on the measure of instructional words, I administered measures of near transfer words and far transfer words. I gave students intermittent, general verbal praise for working hard, when appropriate. After administering the measures, I thanked the students for their participation and allowed them to choose a sticker. I then walked each child back to the classroom. Baseline data were taken on an individual student no more than twice a day. Baseline sessions lasted approximately five minutes.

Instruction

Following baseline, each student was seen individually four or five times a week for approximately 15 minutes for 8 to 16 training sessions. In each session the child read one of the eight *Rime to Read* books, while I followed a specific intervention script developed specifically for the study (see Appendix G). The books were read in numerical order 1-8. The books are organized with a cumulative list of targeted rime words on the left hand page and story text using new and old rime pattern words on the right hand page. If the child hesitated for five seconds or incorrectly named a word on either page, a correction procedure was employed (see

Appendix G). After completing a left hand page for which the correction procedure was required, the child was instructed to reread the page; for a right hand page, to reread both pages. If a child required the correction procedure more than 5 times in books 1-4, or 8 times in books 5-8, the book was reread during the following session. Research has shown that repeated reading of a selection or book results in improved identification of instructional words (Dowhower, 1994; Levy, 1993; Nelson, Alber, & Gordy, 2004). However, due to time limitations, no child read a book more than two times. After completion of a book on a given day, the session ended. There were no more than two instructional sessions per day. These criteria were based on my experience using the books to instruct children.

The story text on the right hand pages of the books contains a limited number of sight (non-rime pattern) words (e.g., the, and). Sight words, if used on a page, are printed (the first five uses) in a box at the top of the page and named for the child before the child reads the text. If a child had difficulty with a sight word (e.g., the), I read the word for the child, since sight words were not the focus of the training. Sight word corrections were not counted in the tally of allowable corrections.

The back inside cover of each book is a review page containing a cumulative list of all rime pattern words (organized by rime without color coding). After successful completion of a book, the child read this review page. If a child made an error on this page, I provided the correct word and asked the child to reread all words from the rime family in which the error occurred. If a participant needed to read a book a second time, the child read the review list from the previous book before such

rereading. Review page corrections were not counted in the tally of allowable corrections.

Students were given general verbal praise for working hard after completion of a book. After the intervention session the child was thanked for his/her hard work and given a sticker of his/her choice. I then walked the child back to the classroom.

Adaptations to Instruction during Study

An additional instructional procedure was added to the intervention as a result of the first student's difficulty reading the rime family instructional words when out of word family order in the context of the story, even after rereading a given book. After completion of the short *a* books (1-4), and then short *e* books (5-8), the child was given flash cards with the targeted words from the four rime families printed one to a card with color-coding. The child was instructed to sort the words into word families, read the words as sorted, and then read the words after shuffling into random order. If the child made an error on any of these tasks, I supplied the correct response. The same sequence was then repeated without color-coding of the words. Regardless of performance, this activity was only completed once in the color-coded condition, and once in the black print condition. This procedure was used with all subsequent students regardless of whether or not they had difficulty reading the words in context out of word family order. Word study techniques involving sorting of words into spelling patterns have been shown to improve children's reading and spelling skills (Joseph, 2002; Joseph & Orlins, 2005; Zutell, 1998).

The letters b and d were consistently confused by all four students during screening. Since the focus of the instruction was not letter and sound identification,

when children confused the letters b and d during instruction and on baseline and post instruction measures, I identified the correct letter (e.g., "The first letter is a b") for the student. If the student responded with the appropriate word, the original misreading was not counted as an error. Anecdotally it appeared that for three of the students, confusion of the letters b and d seemed to decrease as the children progressed through the books.

The meaning of a number of vocabulary words (i.e., den, well) was unfamiliar to the students. Since John had particular difficulty learning to decode such words, students were instructed in word meanings, as appropriate.

Post Intervention

Once a child progressed successfully through the first eight *Rime to Read* books, post training data were collected. Again, each child was met in the classroom and walked to a quiet room where data were collected on measure 1 (instructional words). The same instructions were given as during baseline. In accord with the baseline procedure, the measure was untimed and incorrect and correct responses were not acknowledged. No measure was administered more than twice a day. Once an increase consistent over a minimum of three consecutive sessions was established for measure 1 (instructional words), Measures 2 and 3 (transfer words) were administered. Maintenance data on the three measures were taken one week and one month after post training data were taken. Students were given general verbal praise for working hard after the administration of the measures. Students were thanked for their participation and given a sticker of their choice. I then walked the child back to the classroom.

Reliability and Fidelity

Inter-Rater Reliability

The administration of baseline and post training measures was audio-recorded. An independent rater listened to and scored 33% of data collection sessions for the instructional measure, and 100% of the data collection sessions for the transfer measures. Inter-rater reliability was calculated for each measure. The following formula was used:

Lower Number of Correct Responses   X 100%
Higher Number of Correct Responses

The reliability was 86 % with a range from 67% to 100% for the measure of instructional words, 89 % with a range from 75% to 100% for the measure of near transfer words, and 91% with a range of 67% to 100% for the measure of far transfer words. The broad range for reliability resulted from the fact that at baseline (prior to instruction) the children received very low scores on the measures. Therefore, minimal scoring differences resulted in low reliability scores. For example, although the raters scored only one item differently on the measure of instructional words (i.e., 2 versus 3 of 20 words read correctly) the reliability score was 2/3 or 67%. Due to the wide range of reliability resulting from the above formula, reliability was also calculated using the following formula:

Number of Agreements   x 100
Number of Agreements and Disagreements

The reliability using the above formula was 90% with a range from 85% to 100% for the measure of instructional words, 88% with a range from 75% to 100%

for the measure of near transfer words, and 91% with a range from 83% to 100% for the measure of far transfer words.

Treatment Fidelity

Treatment fidelity was measured by audio-recording each session and having an independent rater listen to the first two sessions with participant 1 and then 33% of the subsequent sessions (randomly selected across participants) to determine whether or not the intervention script and correction procedures were followed with fidelity. Fidelity of treatment was rated for each selected session using a rubric designed for this purpose (Appendix H). The first two sessions were reviewed immediately to identify any problems with fidelity. A minor fidelity of treatment issue was identified and corrected for subsequent sessions. Overall fidelity of treatment was 96% on average with a range from 87% to 100%.

Chapter 4 Results

I organized the results of the study into four sections. The first section presents information about each of the participants during instruction; the second section presents results of the intervention regarding instructional words; the third section, results regarding transfer words; the fourth section presents information about the participants in relation to national norms as measured before and after the intervention by the Woodcock Reading Mastery Test.

Student Behavior during Instruction

John

During the intervention, John came willingly to all sessions and worked diligently. He was very quiet and never initiated a conversation, speaking only in response to questions. He never reacted verbally to the illustrations or to the story line. John reread every book due to multiple errors (above the criterion for successful completion) during the initial reading of the book. He never objected to rereading. During the second reading of each book his performance was much improved, especially if more than one day had elapsed between readings.

Because John still made a number of errors while reading the instructional words in context during the second reading, an instructional procedure was added. As explained previously, he sorted the instructional words (printed on flash cards) for each set of four short vowel word families by rime pattern after reading the corresponding four books, read the words as sorted, then read the words in random order after shuffling the cards. He completed this flash card activity twice, once with

color-coding of the rimes, once without. I added this procedure to the instruction of subsequent students.

In addition to needing to reread each book due to numerous errors, John's processing time was slow in relation to the other students. It took him on average 25 minutes to read a book. John received 16 instructional sessions of 25 minutes each for a total of 400 minutes (6 2/3 hours).

John did not seem to attend to the color-coding. When sorting the flash cards into rime patterns he did not use the color-coding as an aid. Rather he closely inspected and named the letters in the rime pattern to sort. He also did not refer to the color-coding during instruction.

Tammy

Tammy, in contrast to John, was interested in the pictures and the illustrations during the sessions. Often she used the illustrations to predict what would happen. She also attended to the color cues, stating "Oh no, that is a different color" after misreading a word. She initially expressed dismay when asked to read the rime family words on the back cover of the book without the color cues.

Although Tammy was very talkative during the sessions, often discussing the stories and commenting when a character reappeared in the illustrations, she remained well focused. Tammy took her time and worked hard during the sessions. However, she reacted very negatively to any mistakes, becoming noticeably more distracted and careless. She expressed the belief that she was the worst reader in the school. Tammy read seven books once and one book twice. She was upset about having to reread the book and her performance did not improve during the rereading. Tammy

seemed to enjoy the sessions and was unhappy when her sessions ended. She received

nine instructional sessions of approximately 15 minutes each for a total of 135

minutes (2 1/4 hours).

Arthur

Although Arthur was initially reluctant to work with me, after the first session

he seemed to enjoy the one-to-one instruction and initiated many conversations about

his weekend and after-school activities. He became more and more animated as the

sessions continued, even spontaneously singing the last two books. Arthur worked

hard during the sessions and remained well focused throughout instruction. He often

asked if he could read more than one book in a given session. He made few errors and

only needed to reread one book. He commented on the illustrations and that all the

short *a* rimes were different blue colors. He completed the flash card activities

quickly without error. He received 9 sessions of approximately 15 minutes each for a

total of 135 minutes (2 1/4 hours) of instructional time.

Maria

During the sessions, Maria was generally very cooperative and attentive.

However, getting her to and from the intervention classroom presented a bit of a

challenge. She initially insisted on visiting the bathroom, getting a drink, and

arranging her desk before coming me. After a session ended she took a very long time

choosing a sticker and often argued for extra stickers. On some days, she attempted to

take extra stickers when she thought I was not looking. Her resistance decreased,

however, with each subsequent session. In contrast to her early reluctance, once her

intervention sessions ended and I was working with another student, Maria frequently

asked to go with me to read more books.

Maria indicated that she felt dependent upon the color-coding, initially

refusing to sort and read the flash card words without the color-coding. However, in

spite of her anxiety, she read the shuffled flash card words very accurately in both the

color-coded and black print condition.

Maria only needed to read each book once. She received 8 sessions of

approximately 15 minutes each for a total of 120 minutes (2 hours) of instructional

time.

Results for Instructional Words

Figure 1 presents the percentage of instructional words correct for each of the

four participants on measures administered during baseline, after instruction, and at

one week and one month maintenance. Table 3 contains each student's individual and

mean scores in each condition.

John

During baseline, John earned a mean score of 4% with a range from 0% to

5% correct. Following the intervention, he received a mean score of 70% with a

range from 60% to 80%. His performance was 70% correct at one week maintenance,

and 65% correct at one month maintenance.

Tammy

During baseline, Tammy earned a mean score of 7% with a range from 0% to

15% correct. Following the intervention, she received a mean score of 79% correct

Figure 1: Percentage of Instructional Words Correct

Instructional Words

% Correct

Sessions
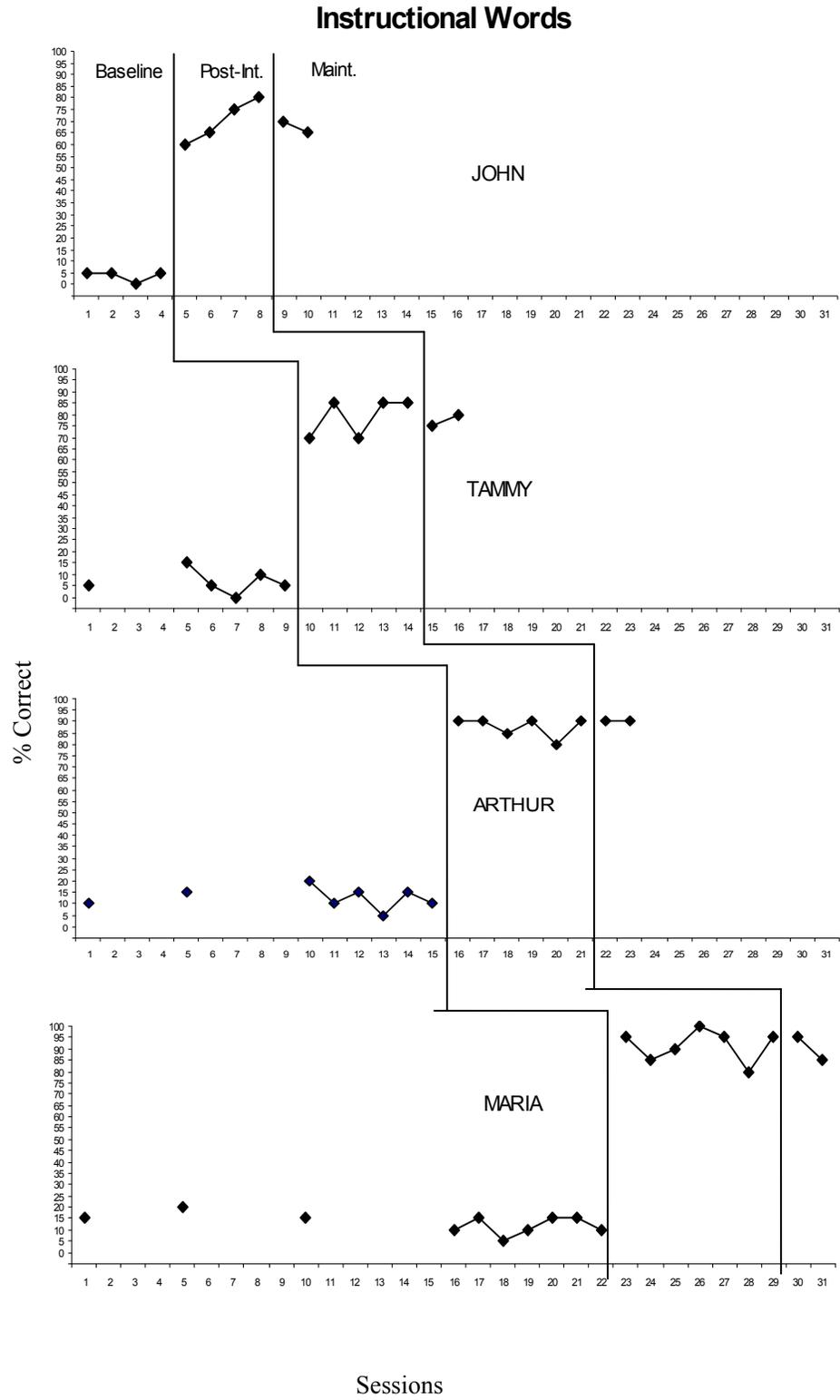
with a range from 70% to 85%. Her performance at one week maintenance was 75% correct, and at one month maintenance was 80% correct.

Table 3

Instructional Words: % Correct

Student	John	Tammy	Arthur	Maria
Baseline	05	05	10	15
	05	15	15	20
	00	05	20	15
	05	00	10	10
		10	15	15
		05	05	05
			15	10
			10	15
				15
				10
Mean	04	07	12	13
Post-Intervention	60	70	90	95
	65	85	90	85
	75	70	85	90
	80	85	90	100
		85	80	95
			90	80
				95
Mean	70	79	88	91
Maintenance 1	70	75	90	95
Maintenance 2	65	80	90	85

Arthur

During baseline, Arthur earned a mean score of 12% with a range from 5% to 20% correct. Following the intervention, he received a mean score of 88% with a range of 80% to 90%. His performance at one week and one month maintenance was 90% correct.

Maria

During baseline, Maria earned a mean score of 13% with a range from 5% to 20% correct. Following the intervention, she received a mean score of 91% with a range from 85% to 100%. Her performance at one week maintenance was 95% and one month maintenance was 85% correct.

Results for Transfer Words

Figure 2 presents the percentage of near transfer words correct for each of the four participants on measures administered during baseline, after instruction, and at one week and one month maintenance. Figure 3 presents the percentage of far transfer words correct for each of the four participants on measures administered during baseline, after instruction, and at one week and one month maintenance.

Table 4 includes information on the percentage of transfer words correct for each participant at baseline, post intervention, and at one week and one month maintenance. Transfer effects are divided into near (novel words from instructed rime patterns) and far (novel words from uninstructed rime patterns) effects.

Figure 2: Percentage of Near Transfer Words Correct

Near Transfer Words
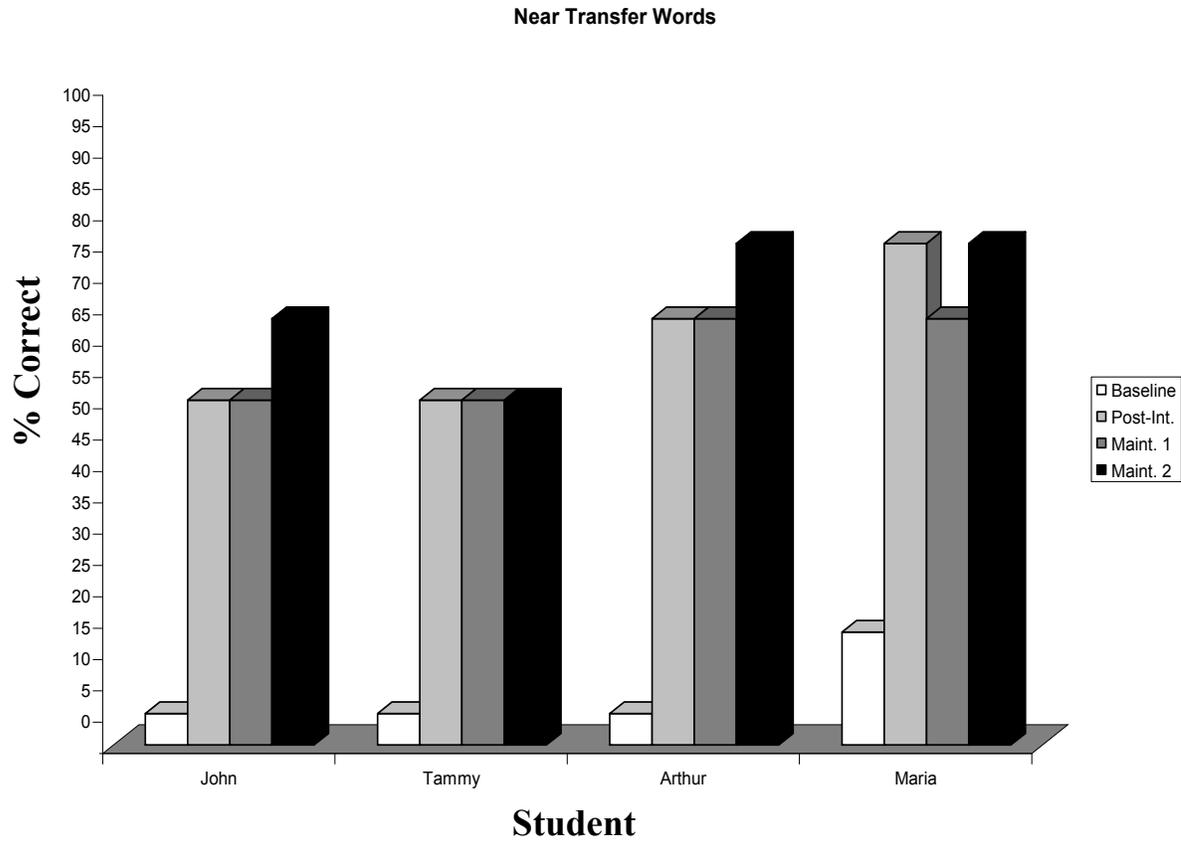
John

At baseline, John scored 0% on the measure of near transfer words. After the intervention his score improved to 50% correct. He also earned this score at one week maintenance. At one month maintenance his score improved to 63% correct.

At baseline, John read 0% of the far transfer words correctly. After instruction he read 17% of these words correctly. His score improved to 33% at one week and one month maintenance.

Figure 3: Percentage of Far Transfer Words Correct
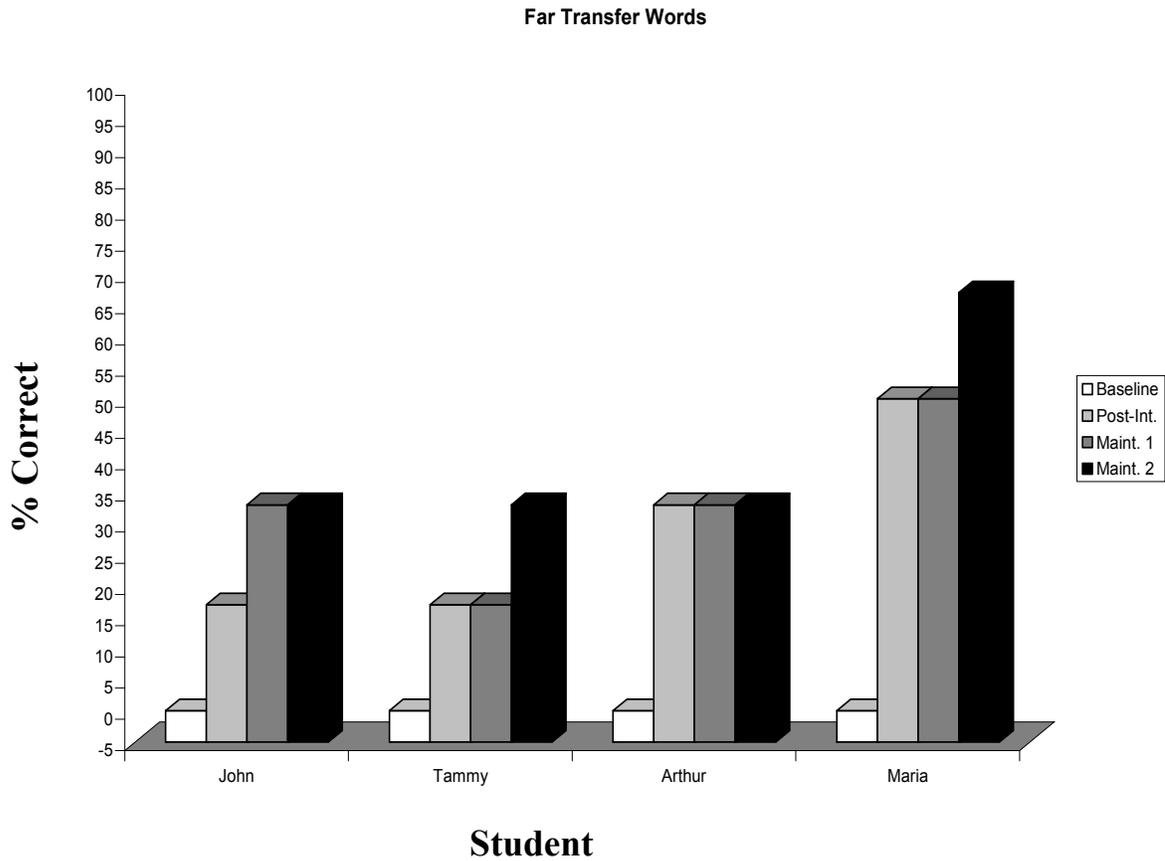
Far Transfer Words

Tammy

At baseline, Tammy scored 0% on the measure of near transfer words. After the intervention her score improved to 50% correct. She also earned this score of 50% at one week and one month maintenance.

At baseline Tammy read 0% of the far transfer words correctly. After instruction she read 17% of these words correctly. She maintained her score of 17% at one week, and improved to 33% at one month maintenance.

Table 4

Transfer Words: % Correct

Student	John	Tammy	Arthur	Maria
Near Transfer				
Baseline	00	00	00	13
Post-Int.	50	50	63	75
Maint. 1	50	50	63	63
Maint. 2	63	50	75	75
Far Transfer				
Baseline	00	00	00	00
Post-Int.	17	17	33	50
Maint. 1	33	17	33	50
Maint. 2	33	33	33	67

Arthur

At baseline, Arthur scored 0% on the measure of near transfer words. After the intervention his score improved to 63% correct. He also earned this score at one week maintenance. At one month his score improved to 75% correct.

At baseline Arthur read 0% of the far transfer words correctly. After instruction he read 33% of these words correctly. His score remained at 33% at one week and one month maintenance.

Maria

At baseline, Maria scored 13% on the measure of near transfer words. After the intervention her score improved to 75% correct. At one week maintenance her score dropped to 63%, but went back up to 75% correct at one month maintenance.

At baseline, Maria read 0% of the far transfer words correctly. After instruction she read 50% of these words correctly. Her score of 50% was maintained at one week and improved to 67% at one month maintenance.

Woodcock- Reading Mastery Test-Revised, Normative Update Scores

Table 5 presents the scores of the students on the Woodcock Reading Mastery Tests-Revised, Normative Update (WRMT-R, NU). The students were administered the Word Identification and Word Attack subtests of that measure. Those two subtest scores were combined to calculate a Basic Skills Cluster score. John, Tammy, and Arthur showed much improvement in their performance as measured at pre-and post test (one month after instruction ended). Maria did not show much improvement between pre-and post test. However, her scores were quite strong at pre-test. The student scores on the WRMT-R, NU should be interpreted with caution because at pre-test three of the four students were unable to decode any words correctly on the Word Attack subtest, and one student was not able to read any words correctly on the Word Identification subtest, indicating floor effects. In addition, John and Tammy received daily individual instruction focused on sight word identification in their classrooms between pre-and post test.

Table 5

Performance on Woodcock-Reading Mastery Test-R, NU

Student	WRMT Subtest	Raw Score		% Grade-Based Norms		SS Grade-Based Norms	
		Pre	Post	Pre	Post	Pre	Post
John	WID	0	9	2	36	68	95
	WA	0	4	9	54	80	101
	BSC			3	42	72	97
Tammy	WID	4	11	19	33	87	93
	WA	0	5	6	52	77	101
	BSC			12	40	83	96
Arthur	WID	12	31	37	74	95	110
	WA	0	8	3	65	72	106
	BSC			15	71	85	108
Maria	WID	12	27	48	63	99	105
	WA	3	6	44	52	98	101
	BSC			45	59	98	104

Note:
WID-Word Identification
WA-Word Attack
BSC- Basic Skills Cluster

Chapter 5 Discussion

The purpose of the present study was to evaluate the effectiveness of a color-coded, onset-rime instructional program with first grade children at serious risk for reading disabilities. Overall, the children learned the instructional words and could transfer that knowledge to decode novel words from instructed rime patterns. One of the participants was also able to decode novel words from uninstructed rime patterns following the intervention. In the first section of this chapter, I provide a summary of the study and a discussion of the importance of the results. In the second section, I address the results of the study in relation to the four research hypotheses. The third section is a general discussion of findings across hypotheses. The final section addresses study limitations and implications for practice and further research.

Summary and Importance

Despite unprecedented national attention to early reading instruction, some children have great difficulty mastering sound symbol relationships and are unable to transfer acquired decoding ability to read novel words. Beginning readers who are weak decoders usually continue to fall behind in reading throughout their schooling, negatively affecting their overall academic performance, self-esteem and motivation. The development of instructional practices to assist students with the most severe reading disabilities is imperative.

Current remedial programs generally provide instruction at the level of the phoneme, based on the assumption of a core phonological awareness processing problem. Such approaches have resulted in limited transfer of acquired skills, and have not even been effective in teaching instructional words to children with the most

severe disabilities. Torgesen, Wagner, and Rashotte (1997) stated that there are major gaps in our knowledge of how to teach reading effectively to the 3% to 5% of children with the most severe reading problems, a problem that research must directly confront.

This study confronted this issue with a unique approach, focusing on the sub-syllable, onset-rime level rather than the phoneme and providing orthographic support by color-coding the rimes. I used a single-subject multiple probe design across four participants. Participants were selected from all first graders who received parental permission based on their inability to decode instructional words. The four students were determined to be among the most-at-risk first graders based on screening results.

The intervention, which targeted the decoding of CVC/CVCC words, was effective with all four students in learning instructional words. Furthermore, all four students were able to use their knowledge concerning the decoding of instructional words to read novel words from instructed rime patterns. However, three of the four students were not successful in applying their skills related to the decoding of instructional words to decoding novel words from uninstructed rime patterns.

In spite of this lack of transfer of decoding skills to uninstructed rime patterns, the study indicated that first graders at serious risk for reading problems can make progress in acquiring beginning reading skills given one-to-one instruction using a color-coded, onset-rime approach. This is important given previous findings that such students typically do not respond to remedial programs proven effective with less at-risk students. The effectiveness of the program with significantly at-risk readers in a typical elementary school is a promising first step in finding an approach to decoding

that is successful with the students who have been left behind not just by traditional classroom instruction but by remedial approaches as well.

Discussion of Findings in Relation to Hypotheses

Hypothesis 1:

A color-coded, onset-rime decoding intervention will be effective in improving performance on taught words for students with or at risk for reading disabilities.

Effectiveness with instructional words. The finding that the intervention was effective in teaching instructional words is consistent with existing literature examining the effectiveness of onset-rime based instruction for children with or at risk for reading disabilities (Levy & Lysynchuk, 1997; Savage, Carless, & Stuart, 2003; Walton, Walton, & Felton, 2001;). All four of the students made strong progress in learning the instructional words, increasing on average 73% over baseline (range 66%-78%). The intervention was least effective for John, the student with the lowest performance on the screening measures and the weakest baseline performance.

Hypotheses 2 and 3:

Students will transfer their ability to decode instructional words to novel short vowel words from instructed rime patterns presented in random order without color-coding (near transfer).

Students will transfer their ability to decode instructional words to novel short vowel words from uninstructed rime patterns presented in random order without color-coding (far transfer).

Effectiveness with transfer words. The results of this intervention regarding transfer of decoding skills to uninstructed words were positive for words from

instructed rime patterns. Students increased their scores on the near transfer measure from baseline to post-intervention by an average of 56% (range 50% to 62%). The transfer of skills to instructed rime family words in this study is encouraging since current remedial approaches have resulted in limited transfer of skills to the decoding of uninstructed words (Lovett, Barron, & Benson, 2003; Lovett, Laceranza, & Borden, 2000) for students at serious risk for learning disabilities. Unfortunately, strong transfer to novel words from uninstructed rime patterns was not found for three of the students. Students improved their scores on the measure of far transfer words by an average of 29% (range 17% to 50%). One possible factor that could have contributed to the lack of far transfer is that the short *a* and short *e* vowel sounds are often distorted by the final consonant sound in a CVC word or syllable (e.g., jam, men).

The transfer pattern of the four students is consistent with Levy and Lysynchuk's (1997) finding of stronger transfer to words from instructed than uninstructed rime patterns. They found that students in the rime condition on average read 53% of uninstructed words sharing the rime with instructed words (e.g., cat, rat) correctly, but only 34% of uninstructed words sharing the onset and vowel (e.g., cat, can) correctly. In contrast to the current study, Levy and Lysynchuk did not measure transfer to CVC words that only shared the vowel (e.g., cat, bag) with instructional words. Possibly such transfer would have been even weaker since decoding such words is a much more complicated process that decoding words that share the onset and the vowel. To decode a novel CVC word that shares the onset and vowel with a known word the child only needs to substitute the final consonant. However, to

decode a novel CVC word only sharing the vowel with an instructional rime family word a child needs to:(a) break the rime in the known word into its phonemic components, (b)extract the common vowel sound, (c)match phonemes (CVC) to the letters in the unknown word, and (d)sequentially blend the phonemes into the word.

The children's ability to transfer their ability to read instructional words to uninstructed rime-family words does not support the contention of Ehri (1992) that children need decoding skills to read words by analogy. She found that children who could not decode nonsense words at pre-test were unable to draw analogies between taught and novel words sharing the rime. Three of the children in the current study earned a score of zero on the Word Attack subtest of the Woodcock Reading Mastery Test (WRMT-R, NU), a measure on nonsense word decoding, at pre-test. In spite of this inability to decode nonsense words, the students increased their scores on the near transfer measure from baseline to post-intervention by an average of 56%.

In contrast, students only improved their scores on the measure of far transfer words (sharing only the vowel) by an average of 29%. The lack of transfer to words sharing only the vowel with instructed words does not support Goswami's (1993) claim that onset-rime based instruction leads to transfer at the onset-rime and the vowel-level. However, Goswami's research regarding transfer of decoding gains to novel words sharing the vowel was with normally developing readers. Furthermore, the children in Goswami's 1993 study who transferred knowledge at the level of the vowel were older on average (6.10 years old) than children in the current study (6.2 years old). In fact, Goswami found that younger children (6.5 years old) only evidenced transfer to words sharing the rime with key words.

Importance of mastery for transfer. The student with the strongest transfer of gains to words from uninstructed rime patterns post intervention (50%) was Maria who achieved one post intervention score of 100% for instructional words. This is in keeping with the research of Levy and Lysynchuk (1997) and Compton et al. (2005) who stressed the importance of mastery learning for acquiring transfer. Possibly transfer would have improved for the other students if the criteria for advancement to the next book had been stricter or if training had continued until they had achieved 100% mastery on probes of instructional words.

Hypothesis 4:

Students will maintain their decoding skills for instructional and transfer words one week and one month after instruction ends.

Maintenance of reading gains. The finding that gains for instructional as well as near and far transfer words were generally maintained at one week and one month maintenance is positive and supports the effectiveness of the program. The evidence of strong maintenance is in accord with the findings of Levy and Lysynchuk (1997) that gains from onset-rime instruction were well maintained.

This finding of maintenance of gains for instructional as well as transfer words is important given the contradictory findings of Bruck and Treiman (1992) that acquisition of reading skills, although fastest with onset-rime instruction in comparison with instruction organized at other sub-word levels, showed the poorest maintenance of skills. They taught first graders to read 10 words by analogy to cue words. For one group, the analogous unit was the rime; for the second group, the initial consonant vowel cluster; for the third group, the vowel. The next day a

retention task was administered. The researchers found that although the acquisition of the 10 words was fastest in the onset-rime condition, the retention of their learning was the lowest at maintenance. However, in contrast to the current study, words were not presented in rime families, maintenance was measured one day after instruction, and the students were not at risk for reading problems.

An interesting finding in the current study is that for three of the four students near transfer scores, and for two of the students far transfer scores, increased between one week and one month maintenance. Possibly the instructional emphasis on common elements and using knowledge of known words to decode unknown words prompted the students to adapt their decoding approach over time and take better advantage of classroom instruction. This explanation is in keeping with the suggestion of Greaney et al. (1997) that children with reading disabilities have the ability to draw analogies to decode successfully but, unlike normally achieving readers, do not spontaneously use that ability.

<div align="center">

General Discussion of Findings

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Child Differences

Instructional time. John repeated every book due to numerous errors during the initial reading. Tammy and Arthur only reread one book due to errors. Maria never needed to reread a book. In addition to requiring rereading of each book, John also took a longer time than the other three students to read a given book (25 versus 15 minutes). In spite of the increased treatment time, John's improvement was the least of the four participants. Had he not been allowed to progress at his own pace, his progress would probably have been even weaker. John also might have benefited

from rereading the books a third time and from more practice with sorting and

reading the flash cards. However, due to time limitations and a necessity to adhere to

the intervention script and pre-established protocol, John was only allowed two

readings of a given book and one lesson with the flash cards. Of interest is that

John's ability to read instructional words improved on each post intervention

measure, in spite of the fact that he was no longer receiving instruction. This finding

is in keeping with his pattern of achievement during instruction. When rereading a

given book John's performance was greatly improved, although there was no

instruction between readings.

Classroom instruction. Researchers have stressed the importance of direct

instruction in phonics for first graders (Forman, Francis, Hurwitz, Fletcher,

Schatschneider, & Metha, 1998; Torgesen, 2002). Maria and Arthur were in a

classroom with no direct instruction in phonics. John and Tammy's teacher, in

comparison, provided direct instruction in phonics on a daily basis. It is possible that

Maria and Arthur's difficulties decoding the CVC/CVCC words on the screening and

baseline measures were the result, in part, of the limited phonics instruction. The

finding that Arthur and Maria made the strongest overall gains from pre-to post test,

supports this interpretation.

The classroom emphasis on whole words instruction may have hindered the

decoding progress of Maria, in particular. She performed poorly on the screening and

baseline measures when asked to decode real CVC/CVCC words, but she scored in

the average range when decoding nonsense words at pre-test (WRMT-R, NU). On the

screening and baseline measures of real words Maria seemed to be quickly naming

the first word she thought of rather than matching sounds to symbols to decode. In contrast, the word attack subtest of the WRMT-R, NU requires the student to decode nonsense words rather than real words. The knowledge that the stimuli were non-words might have led Maria to slow down and attempt to phonetically decode the words, rather than guess at a real word that resembled the stimulus. It is possible that Maria had developed phonic skills in kindergarten but was not spontaneously using them to decode as a result of her first grade classroom instruction emphasizing whole words. The published county curriculum for kindergarten calls for a heavy emphasis on phonic decoding.

Emotional factors. It is also possible that other factors negatively affected Maria's performance on baseline and screening measures. According to her teacher, Maria had behavioral and emotional problems that affected her ability to benefit from classroom instruction. Her teacher also stated that she resisted individual and group reading instruction. Often when I went to pick up Maria from her classroom I would find her hiding under the teacher's desk during classroom activities.

During the intervention, Maria was initially quite reluctant to participate in the sessions and rushed through the materials. As the sessions progressed, however, and Maria was provided with a systematic decoding approach, she slowed down and became very focused and cooperative. She also appeared to become more comfortable and confident. The change in her behavior and attitude toward reading, in my opinion, contributed greatly to her progress.

Use of color-cues. John, who made the slowest and most limited progress, appeared to pay the least attention to the color-coding component of the intervention.

He never commented on the color-coding, and the color-cues did not seem to be beneficial in helping him differentiate the rime families. Anecdotal evidence indicated that the other three children did use the color-coding to aid decoding. Tammy stated when seeing the review pages at the back of Book One, "Oh no, where are the colors"; and she said after misreading a word, "Oh, it is a different color." Maria and Tammy were reluctant to complete the flash cards in the black only condition. Arthur discussed that all short *a* books were blue and all short *e* books were red. Tammy, Arthur, and Maria also used the color cues to rapidly sort the flash cards into rime patterns. In contrast, John looked closely at the letter sequences and verbalized the letters to sort. Possibly the intervention script should have been adapted with John to include more specific reference to the color-coding. It should be noted that John also had the lowest scores at baseline.

Specific Methodological Factors in Comparison to Literature

Total instructional time. The fact that the intervention was effective for instructional words and near transfer words for all of the four students is promising given the total amount of instructional time. The length of treatment in this study compares well to that required in other interventions (Levy & Lysynchuk, 1997; Savage, Carless, and Stuart, 2003; Walton, Walton and Felton, 2001). For example, in the Levy and Lysynchuk study, children were instructed to read 32 words (eight rime patterns) during a maximum of 25 individual sessions per student. Unfortunately, the researchers do not state the length of each session. In comparison, for two of the students in this study the total number of sessions was nine. The maximum (John) was 16 instructional sessions. The relatively short length of treatment is encouraging

given the suggestion of Lovett et al. (1990) that the profound deficit in phonological

processing of children with dyslexia may require a prolonged period of training

before decoding skills may develop.

Participants' risk for reading problems. The fact that the intervention was

effective in teaching instructional words and near transfer words for all of the four

students is promising given their very weak pre-intervention reading skills. Regarding

their ability to read instructional words, the four participants were among the lowest

of all students receiving parental permission who met screening criteria. Such

students often do not respond to the best remedial practices currently available

(Lovett et al., 1990; Torgesen et al., 1997). In comparison to the current study, Walton

et al. (2001) selected the lowest 40% of 77 first graders, and O'Shaughnessy and

Swanson (2000) selected second graders who scored below the 25th % on The

WRMT-R for their study. Levy and Lysynchuk (1997) worked with the lowest 100 of

150 first grade and kindergarten students, whereas Savage, Carless, and Stuart (2003)

chose the lowest 25% of all first grade students as participants. Therefore, it is likely

that these other studies included students with much better skills than the four

children in this study. The results from the other studies may not generalize to

children with the most severe disabilities.

Effectiveness of Color-Coding

Regarding the variability in the students' attention to the color-codes

(discussed in the previous section), a related question is whether or not the color-

coding needs to be systematically faded to a black print condition. There was no

systematic fading in this study. The children's only encounters with the words without

the color-codes were when they read the review page of pattern words at the end of the book and when they read the words on flash cards in the black print condition. Since all four participants in this study were able to read the pattern words on the back cover of the book with minimal error, it indicates that fading was not required. This finding is at odds with the research of Goodman and Cundick (1976) who used color-cues to teach Hebrew symbols and found that a systematic fading procedure was required. However, it is in accord with the research of Van Houton and Rolider (1990) who used color cues to teach number identification and multiplication facts to students with learning disabilities and determined that fading of the color cues was not necessary.

Possibly a systematic fading procedure was not required in this current study for the children to be able to read the words without color-coding because the intervention script intentionally contained little reference to the color-coding element. The color-coding was intended as visual support for categorization and discrimination, rather than as a verbal label. In addition, the use of shades of the same color (e.g., four shades of blue, four shades of red) in the color-coding system did not encourage over-reliance on the color cues to identify the word families. In contrast, the colors assigned to symbols in the Goodman and Cunick (1976) study were distinct (e.g., red, green) and the color name was easily substituted for identification of the unfamiliar symbols to name the corresponding nonsense word. As discussed above, however, John might have benefited from more attention to the color-coding in the intervention script.

Limitations and Suggestions for Practice and Further Research

Limitations

One limitation is that I delivered the intervention and collected the data regarding the effectiveness of the intervention. It is possible that the children's performance on the post test and maintenance measures was linked to me. Ideally, another individual unfamiliar to the participants would have collected data.

Another limitation is that due to the multi-faceted nature of the intervention it is impossible to isolate the effectiveness of the individual elements, in particular the color-coding. Regarding the effectiveness of the color-coding component of the instructional program, no conclusions can be drawn without further research. It is also not possible to separate the effect of repeated reading of the books in response to student errors, or the effect of the word-study work with the flash-cards.

A final limitation is that the study did not offer any information concerning the relative effectiveness of the intervention in comparison with other programs, such as an equivalent program organized at the level of the phoneme. Although the onset-rime instruction was relatively effective, instruction at the phoneme level may produce similar results despite arguments in favor of onset-rime instruction (Levy & Lysynchuk, 1997; O'Shaughnessy and Swanson, 2000; Savage et al., 2003).

Suggestions for Practice.

I have a number of suggestions for practice based on my experience using the intervention materials during the study. The first recommendation is that instruction be more explicit regarding the cognitive processes involved in reading words grouped by rimes. A second and related recommendation is that instruction include more

specific reference to and explanation of the color-coding scheme used in the intervention, especially for students who do not note the color cues. A final recommendation is that although small group instruction using the color-coded, onset-rime approach may be adequate for a number of students at risk for disabilities, individual instruction may be required for those students most at risk to allow them to proceed at an appropriate instructional pace. Individual instruction would also allow repeated readings and additional word study, as necessary.

Suggestions for Future Research

Four issues guide future research on color-coded, onset-rime instruction. One issue relates to the impact of the color-coding component of the intervention. Another issue relates to the effectiveness of the program in comparison with phoneme level instruction. A third issue relates to the effect of adaptations to the intervention. A final issue relates to observations about the at-risk participants.

Future research should evaluate the effectiveness of the color-coding. A possible study is a group design with participants randomly assigned to color-coded or blocked rime condition. Another possible study would look at the relative effectiveness of an alternate visual-support system assigning different fonts, rather than colors, to rime patterns.

The relative effectiveness of the program in comparison with a program organized at the level of the phoneme should also be evaluated. Both programs should either screen students for knowledge of letters and consonant sounds or provide pre-training to develop such skills.

The intervention only used books 1-8 of the Rime to Read series. Future research should investigate the effectiveness of the program in teaching children to read words from all five short vowel rime patterns, extending the intervention to include all 20 books.

Future research should also investigate whether the intervention would be more effective if the criterion for advancement to a new book was 100% mastery (Levy & Lysynchuk, 1997) and/or books could be repeated more than once. Data on mastery after each book could be taken and students would not move on until 100% mastery of rime pattern words was achieved.

If transfer did not occur once 100% mastery of instructional words was attained or if attaining such mastery was too time consuming, the intervention could be adapted to improve transfer at the vowel level. A possible additional instructional approach is a word ladder with changes to the onset, to the final consonant, to the vowel (e.g., bat, rat, ran, run); or inclusion of phoneme by phoneme decoding in the intervention script.

Another suggestion for future research arises from screening data, confirmed by observation, that the first grade participants had yet to master letter names and corresponding sounds for all of the letters used in the intervention materials, in particular the letters b and d. Since these two letters are very common in beginning reading instruction, the added stress provided by their common visual characteristics should be addressed. A research study could focus on the effect of intensive pre-reading instruction of letter and letter/sound identification requiring mastery, on the subsequent reading achievement of at-risk first graders.

Finally, as discussed previously, John, who appeared to be the most at-risk student at baseline, required approximately three times more instruction than the other students did to move through the sequence of books. The use of a single-subject design allowed John to progress at his own pace. Had he been required to keep pace with the others, I think his progress would have been much less. Future research should investigate the interaction between the child's response to instruction and the teacher's instructional pace on the achievement of students most at-risk for reading failure.

APPENDIX A: INFORMATIONAL LETTER TO FAMILIES

September 15, 2006

Dear Families,

Dr. Speece and I are writing to inform you of an opportunity for your child to be selected to receive individual reading instruction this school year as part of a study we are conducting investigating reading intervention with first graders at risk for reading problems. My name is Sara Hines and I am a doctoral student in Special Education at the University of Maryland. I received my Masters in Learning Disabilities from American University and I have been working as a reading teacher/supervisor for over 25 years. Dr. Deborah Speece is my advisor. She has worked extensively in the area of reading research for over 20 years. The purpose of the study we are conducting is to improve children's ability to decode CVC (consonant /vowel/consonant; e.g., *bat*) beginning reading words with a color-coded program.

The intervention will involve instruction on an individual or small group basis. Your child will work up to four times a week with Ms. Hines for a minimum of eight 15- 20 minute sessions. Your child may be asked to read targeted words before and after training to measure progress and may also be administered a reading achievement test.

There is no cost to participate and participation is strictly voluntary.   Parents of all first graders at Laytonsville Elementary are being invited to participate. If you would like your child to participate, please complete the attached form and return it to your child's teacher. Please call either of us if you have any questions or you would like to discuss the program further.

Sincerely,

Dr. Deborah Speece

Office phone: 301-405-6482, Home phone: 301-572-7010

e-mail address: dlspeece@wam.umd.edu.

Sara Hines

Home Phone: 202-966-2993

e-mail address: sara.hines@verizon.net

APPENDIX B: PARENT PERMISSION FORM

Project Title	Effectiveness of a Color-Coded, Onset-Rime Reading Program
Why is this research being done?	This is a research project being conducted by Deborah Speece, Ph.D., and Sara Hines at the University of Maryland, College Park. We are inviting first grade children at your child's school to participate and hope to include your child in our study. The purpose of this research project is to evaluate the effectiveness of a color-coded reading program organized by word families or rimes (e.g. bat, cat, sat) in learning to read words. This information will help us to determine effective reading intervention for first grade children at risk for reading problems.
What will my child and I be asked to do?	If you allow your child to be considered for participation he/she will be given measures of letter names, consonant sounds, and short-vowel words as screening measures. The tests will be given individually (5 minutes). We will also screen to make sure your child is not color-blind (1 minute) because the word families are color-coded. If, after screening, we choose your child to participate in the intervention, we will then administer a reading achievement test and brief measures of instructional content (15 minutes). Your child will then receive individual instruction for 15-20 minutes a day four times a week for approximately two to three weeks. After the instructional period, your child's progress will be measured with the reading achievement test and the brief measures. Ms. Hines will deliver instruction and administer all measures of progress.
What about Confidentiality?	We will do our best to keep your personal information confidential. To help protect you and your child's confidentiality, we will assign a code number to your child and only use those numbers on all test forms. Only Dr. Speece and Ms. Hines will have access to the list of codes and names. Although sessions will be taped to establish reliability, only your child's first name will be used during sessions and tapes will only be identified by student numbers. If we write a report or article about this research project, your child's identity will be protected to the maximum extent possible.
What are the Risks of the Research?	There may be some risks from participating in this research study. Your child may miss some classroom instructional time. We will minimize the loss of instructional time by coordinating schedules with your child's teacher.
What are the benefits of the Research?	Your child will receive individual reading instruction if granted permission to participate. Also, results of the study may help the investigators learn more about how to assist children in the early grades develop reading skills. This knowledge may help schools provide more effective early reading instruction to prevent later

	reading problems.
Do I have to be in this Research? May I stop participating at any time?	Your and your child's participation in this research is completely voluntary. You may choose for your child not to take part at all. If you decide to permit your child to participate, you may stop his/her participation at any time. If you decide that your child will not participate in this study or will stop participating at any time, you and your child will not be penalized or lose any benefits to which you otherwise qualify.
What if I have questions?	This research is being conducted by Deborah L. Speece, Ph.D. and Sara Hines at the University of Maryland, College Park. If you have any questions about the research study itself, please contact Dr. Speece or Ms. Hines at: 1308 Benjamin Bldg., Department of Special Education, University of Maryland, College Park, MD 20742. Dr. Speece: Office phone: 301-405-6482, Home phone: 301-572-7010; email address: dlspeece@wam.umd.edu. Ms. Hines: Home Phone: 202-966-2993; email address: sara.hines@verizon.net If you have questions about your child's rights as a research subject, please contact: Institutional Review Board Office, University of Maryland, College Park, Maryland, 20742; (e-mail) irb@deans.umd.edu; (telephone) 301-405-0678 This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.
Statement of Age of Participant's parent and Permission	Your signature indicates that: you are at least 18 years of age; the research has been explained to you; your questions have been fully answered; and you freely and voluntarily choose for your child to participate in this
Signature and Date	NAME OF CHILD (PRINT)
	NAME OF PARENT (PRINT)
	SIGNATURE OF PARENT
	DATE

APPENDIX C: CHILD ASSENT SCRIPT

Hello, I am Ms. Hines. I will be working with students to find a

good way to teach reading.

I would like you to work with me.

Your parents said that it was OK.

If we work together, I will give you some short reading tests.

We might also work together reading short books for about 15

minutes a day for a couple of weeks.

You might miss some instruction in your classroom.

I will work with your teacher to schedule our sessions.

It will be OK if you decide to stop working with me at any time.

Would you like to work with me?

Child's Printed Name _____

Date _____

APPENDIX D: SCREENING MEASURES

Screening Measure1 Letter ID	
c	d
p	j
r	h
b	e
s	g
P	D
n	w
S	l
m	y
v	f
a	e
B	N

Student ID: _____   Words correct: _____

Date: _____   % correct: _____

Screening Measure 2 Consonant Sounds	
c	f
p	j
r	h
b	t
s	g
n	w
d	l
m	y
v	S
P	D
B	N

Student ID: _____   Words correct: _____

Date: _____   % correct: _____

Screening Measure 3 Instructional Words		
Pat	had	bad
man	Sam	sat
am	rat	get
pad	pen	Nell
ten	wet	jam
cat	pet	bed
fed	bat	mad
sad	ran	den
tell	bell	well
van	Ned	dad
bet	let	fell
Pam	ham	at
men	fed	Ben
met	Dan	yet

Student ID: _____   Words correct: _____

Date: _____   % correct: _____

APPENDIX E: SAMPLE PAGES FROM RIME TO READ:

BOOK 6

Title Page

BOOK 6

The Pet

Rime to Read
A Program for Beginning Readers
by Sara Hines and Lynn Klaiman
illustrated by Shari Hookman Berger
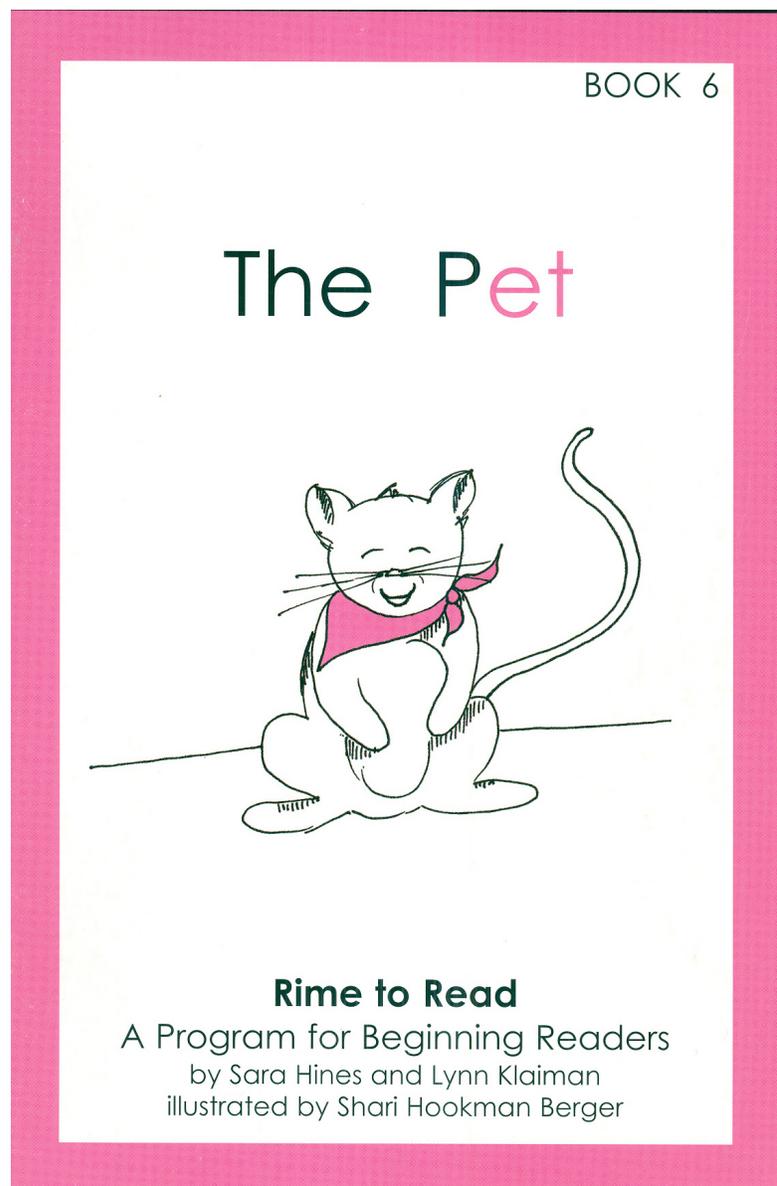
Sample Page Left

pet
met
get
wet
let
bet
yet

Sample Page Right

they   are

Ben sat in the van with the wet pet.

They are wet.

17

Review Page

Rime to Read
Pattern (Rime) Words - Books 1-6

Pat	Ben			
cat	ten			
rat	den			
bat	men			
sat	pen			
at				
Dan	**pet**			
man	met			
ran	get			
van	wet			
	let			
	bet			
	yet			
Dad				
pad				
had				
sad				
mad				
bad				
Pam				
Sam				
am				
jam				
ham				

APPENDIX F   SAMPLE EXAMINER PROBES

Measure 1: Instructional Words	
Probe 1	
met	bat
ran	ten
sad	let
fell	get
den	ham
sat	Nell
wet	bed
red	men
bell	can
Pat	mad

Student ID: _____   Words correct: _____

   Date: _____   % correct: _____

Measure 2: Near Transfer Words

hen	sell
fat	lad
led	set
pan	ram

Student ID: _____   Words correct: _____

Date: _____   % correct: _____

Measure 3: Far Transfer Words	
nap	rag
pep	web
cab	leg

Student ID: _____   Words correct: _____

Date: _____   % correct: _____

APPENDIX G: INTERVENTION SCRIPT

Script for First Book: *Pat*

Introduction
*Today we are going to read this book (*show *Pat).*
This is the first book that we will read together.
We will read eight books in all.
The title of the book is /P/ /at/ /Pat/ (point to each part, then run hand under whole word as you say*).*
What is the Title? (Child should repeat */P/ /at/ /Pat/).*
Yes, the title is Pat.
This is a picture of Pat.
Pat will be the first word you read today.
OK, let's start.

First left hand page.
What is this word?
*Yes, the word is Pat, the title of the book**.***

Correction procedure:
The word is /P/ /at/ /Pat/ like the title of the book (show title).
What is the word? (Child should repeat */P/ /at/ /Pat/).*
Yes, the word is Pat.

First right hand page.
What is this word?
Yes, the word is Pat.
Let's move on to the next page.

Correction procedure:
The word is Pat.
What is the word?

Second left hand page.
Both of the words on this page belong to the same word family, the at family.
That means that they rhyme or sound the same at the end.
They also look the same at the end.
The parts of the words that look and sound the same are printed in the same color
(point to *at* in both words).
What is the first word? (Point).
Yes, the word is Pat.
Let's read the next word.
Remember, only the first sound will be different (point to next word).
Good job reading the at family words.
Let's go on to the next page.

Correction procedure:
What is the first word?
(Yes,) that word is Pat. (If error, leave out <u>yes</u>)
What letter is different in the next word?
(Yes), the P is changed to a c.
What is the c sound?
(Yes), the beginning sound will be /c/.
So the word is /c/ /at/ /cat/.
What is the word? (Child should repeat */c/ /at/ /cat/)*.
Yes, the word is cat.
Let's read this page again.
If error during rereading:
That word is____.

Second right hand page:
Introduce sight word in box:
This word in the box is not a word family word.
It is just printed in black.
This word is <u>and</u>.
What is the word?
Good job.

Let's read the story.
Good job! Let's go to the next page.

Correction procedure for sight words.
That word is _____ (point to word in box).

Correction procedure for text:
That word is _____ (e.g., bat).
What is the word?
At end of page:
Let's read these two pages again.
If error during rereading:
That word is____.

Subsequent left hand pages.
What is the first word? (Point).
Yes the first word is Pat.
Let's read the next words?
Remember, only the first sound will be different (point to each word)
Good job reading the at family words.
Let's go on to the next page.

Correction procedure:
What is the first word?

(Yes), that word is Pat.
What letter is different in the next word?
(Yes), the P is changed to a c.
What is the c sound?
(Yes), the beginning sound will be /c/.
So the word is /c/ /at/ /cat/.
What is the word? (Child should repeat */c/ /at/ /cat/).*
(Yes), the word is cat.
What is this word? (Point to incorrect word/s)
Let's read this page again.
If error during rereading:
That word is____.

Subsequent right hand pages:
Introduce sight words in box:
These words (point*) are not word family words.*
So they are printed in black.
This word is____.
What is the word?
Etc….
Good job. Let's read the story.

Correction procedure for sight words:
That word is _____ (point to word in box).

Correction procedure for text:
That word is _____ (e.g., bat).*
What is the word?
Let's read these two pages again.
If error during rereading:
That word is____.

Back right cover:
You did a great job reading this book about Pat today.
Let's review the at word family words you have learned so far.
What is this word? (Point to <u>Pat.</u>)
Yes! Now, read the rest of the words in the at family (point to each word).*
Good job reading the at family words.

Correction procedure: *This word is Pat* (point to first word).
What is this word (point to error word)?
Let's read all of the words in the at word family again.

End of session:
Thanks for working with me today! You really worked hard and did a great job reading Pat.

Script for Subsequent Books

Introduction:
Today we are going to read _____ (show book).
This is a new book that you haven't seen before.
The title of the book is _____ (point).
What is the Title?
This is a picture of _____.
Remember, _____ *(title) will be the first* ____*family word* (point to highlighted rime in title) *you read today.*
OK, let's start.

Left hand pages:
What is the first word? (Point).
Yes the first word is _____.
Let's read the other words (point to each word).
Good job reading the ____*family words!*
Let's go on to the next page.

Correction procedure:
Point to first word:
*This word is (*onset/ rime, word; *e.g., b/at, bat).*
What is the word?
What is this word? (Point to error word*)?*
(Yes), the word is _____.
*Let's read these*____*family words again.*
If any errors:
*These words are*_____ (read each word while pointing).
Now you read these words.

Right hand pages:
Introduce sight words in box:
This word is _____.
What is the word?
Good job.
Let's read the story.

Correction procedure for sight words.
That word is _____.

Correction procedure for text:
That word is _____ *(e.g., bat).*
What is the word?
If correction procedure required, at end of page:
Let's read these pages again.

Back right cover:
You did a great job reading this book about _____ (title) today.
Let's review all the words you have learned so far.
For each set of rime family words point to first word (title):
What is this word?
Now, read the rest of the words in the ___ family.
Correction procedure: *This word (title) is _____ .*
What is this word?
Read all of the words in this word family again.

Criterion for ending session and rereading a book.
When the correction procedure is required for the fifth time in books 1-4 or the eighth time in books 5-8, the session is ended for the day and the book is reread from the beginning at the next session. Corrections of sight words or on back cover review pages are not counted in tally. Errors during rereading of pages which required the correction procedure are counted.
I think we have worked long enough today.
We'll work with _____ (title) again next time we meet.

During next session have child read review words from previous completed book before beginning rereading.
Hi, let's review these words before we begin today.
After reading review words, show book from last session.
Today we are going to read book X.
This is the same book we worked with last time we met.
The title of the book is _____ .
What is the Title?
The title will be the first word you read today.
OK let's start.
Procedure same as above.

End of session:
Thanks for working with me today! You really worked hard and did a great job reading ____ .

APPENDIX H: TREATMENT FIDELITY RATING FORM

Book #: _____   Date: _____

Student ID: _____   Rater: _____

Procedure Correctly Followed	Rating: Yes=1+1 No=0, NA	Procedure Correctly Followed Cont.	Rating: Yes=1, No=0, NA
Front cover: script (2)*			
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Left page: script and correction (2)		Right page: script and correction (2)	
Review words on back cover: script and correction (2)		Session ended if numerous corrections (re: guidelines) (2)	
Right page: script and correction (2)		If rereading, words from previous book reviewed: script and correction (2)	

*points possible
Rating system: 0-2 points possible
     Script followed=1   Correction procedure followed=1   Not applicable=NA
Score: Sum of Points/ Highest Possible Points: _____

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